An investigation into the use of interaction strategies for children with profound and multiple learning difficulties

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Abstract

This study examined the premise that intensive social interaction facilitates a greater quality of responsiveness and the learning of social routines in children with profound and multiple learning difficulties (pmld). The significant behaviours that adults and normally developing infants use during social interaction and the suitability of their application to children with pmld was examined. Four children with chronological ages of five years, six years, eight years and nine years and designated as having pmld, were videotaped in a classroom setting, in a series of interaction sequences with a teacher. The manifestation of the features of attentiveness, imitation, vocalisation, posture changes, eye contact and facial expressions in children with pmld were considered in relation to adult interactive behaviours of touch, facial movements, vocalisations using infant register, play movements, en face positions with the child and imitation of child behaviours. Analysis of the videotaped data took the form of observation of five second sequences of interaction scored on a schedule indicating the adult and child interactive behaviours. A second observer viewed a number of interactions in the videotaped data to confirm reliability. The indications were that children with pmld show a quality of responsiveness that has implications for the learning of social routines.

Contents

1. Context

1.1 Introduction

There has been generated, in the field of special educational needs, an abundance of literature focussing on appropriate curricula and effective conditions in the teaching and learning process, (Report of the Committee of Enquiry into the Education of Handicapped Children and Young People, 1978; Brennan, 1982; Hegarty et al, 1982; Fish, 1985; Booth et al 1992; Aherne and Thornber, 1993). However, even with a wide range of sources to draw from, the complexity of learning difficulties that some children have has stretched the ingenuity of teachers in their attempts to establish conditions and strategies which might facilitate learning for such children.

From the population of children in schools it has been determined that approximately 18-20% of pupils have, or will have at some time in their school career, a degree of special educational need (Gipps et al, 1987). Furthermore, about 2-3% have more significant learning difficulties which warrant a 'statement' coordinated by the LEA which identifies their special educational needs. For these children the LEA has a responsibility to ensure that provision is made for those needs, and this tends to be within special schools, for example schools which cater for children with moderate or severe learning difficulties (mld/sld). A significant minority of children in schools providing for sld have more complex learning disabilities or profound and multiple learning difficulties (pmld). It is this group of children that this study seeks to address.

1.2 Strategies used in working with children with pmld

There has been a fundamental problem for teachers in determining the range of activities that can enhance the development of children with pmld. Behavioural approaches, that is breaking down skills to be taught into small steps and utilising

conditioned responses (establishing and implementing reward systems to elicit the required behaviour), have been used by teachers in their work with children with pmld for some time. There were advantages in this approach. It provided teachers with ways of measuring children's progress; it focussed on learning and development; it provided a detailed recording system for teachers; the process also was easy to induct staff other than teachers into and so provided more teaching time (Ouvry, 1991). Farrell (1992) has noted that behavioural strategies are most appropriate for teaching educational targets related to personal development. However the behavioural approach to teaching children with severe and profound and multiple learning difficulties, has not always led to desired outcomes. Teaching skills through incremental steps may produce their acquisition but it has been found that these have not always been generalised, that is being able to transfer them from specific situations to other contexts (Berkson and Landesman-Dwyer, 1977). The prescriptive nature of the strategy does not enable spontaneous behaviour (Ouvry, 1991). Furthermore, it has been noted that not all behavioural teaching techniques showed resulting successful learning. Factors such as individual variability in acquisition rates and the difficulty of finding suitable reinforcers (elements which reward appropriate behaviour) and programming in task sequences were not always taken into account (Berkson and Landesman-Dwyer,1977).

In the 1980's a strategy adopted in many schools for children with pmld was a 'sensory' approach. The principles upon which this strategy was based refer to the inability of children with pmld to integrate the information that they receive through their senses. The development of 'Snoezelen' materials, which were environments designed to stimulate all the senses, for example using equipment or areas that had a range of sounds, odours, tactile elements or lighting that the person with pmld could experience, led to their incorporation into strategies for teaching children and adults with pmld (Longhorn, 1984; Hulsegge and Verheul, 1987; Mount and Cavet, 1995). This has been an important development, showing that

there are broader approaches for working with children with pmld, and that they can have an active part in learning which covers several aspects of their development. However, even with this approach there are problems in terms of appropriateness, that is exploratory behaviours can be stimulated but the environment may still produce behaviours not appropriate in other situations (Hulsegge and Verheul, 1987).

1.3 Interaction

One strategy which has become increasingly important for teachers of children with pmld is the utilisation of social interaction. There is good evidence that early mother/child interactions provide the basis for social, emotional, cognitive and language development (Newson, 1978; Schaffer and Crook, 1978; Trevarthen and Hubley, 1978; Kennell et al, 1979; Rogow, 1982; McCollum, 1984; Azmitia and Perlmutter, 1989; McNaughton and Leyland, 1990).

Observations made of normally developing infants show the ease with which they take part in early interaction (Bruner, 1976; Trevarthen, 1979) during the first few months of life. The importance of child/caregiver interaction is recognised by researchers and the fact that difficulties in this area restrict the development of communication:

> "the caregiver confronted with signals from the child that may be difficult to interpret may produce fewer and fewer responses to the child's behaviours. The prospect for developing effective communicative exchanges is bleak indeed" (Schweigert, 1989 p194).

Thus a significant problem experienced by children with profound and multiple learning difficulties is in the area of communication. A low rate of interaction between caregivers and children with pmld has indicated that potential opportunities for learning may be missed and that some styles of interaction may be counterproductive to the communicative process (Beail, 1985; Nind and Hewett,

1994; Ware 1994). It has also been noted that prerequisites for appropriate and effective interaction need to be established in the caregiver's behaviour (Burford, 1988; Healey, 1990; Nind and Hewett 1994; Ware 1996). This is based on the premise that children with learning difficulties proceed through the same developmental sequences as other children albeit at a much slower pace and with a lower developmental ceiling (Weisz, 1982 ;Lister et al, 1989; Zigler and Hodap, 1991). If it is the case that children with pmld follow similar developmental paths as other children who are at prelingual levels but within the limitations already noted then the interaction process, if properly managed, will have measurable benefits for them. This is quite clearly an area of vital importance to the special educator, working with children who have profound and multiple learning difficulties. If these children are to develop personally, socially and cognitively, teachers must find methods to recognise their responses and communicative attempts and use them in the educative process.

1.4 Intensive interaction

A great deal of interest has been shown by teachers in special schools in the notion of 'intensive interaction' advocated by Nind and Hewett (1988, 1992, 1994), as a process for assessing and teaching children with pmld. This is described as a procedure where the teacher devotes his/her attention to a child and adopts a specific teaching style in which there are several stages. Initially, the teacher observes the child to become familiar with his/her behaviour in order to gain an insight into what motivates the child. For example, a child may become animated by a loud noise with the teacher saying the word 'bang' to indicate the noise. This is followed by the teacher making him/herself accessible to the child to show that he/she can influence the teacher. The teacher here places him/herself in close proximity and attempts to give the child some indication that the child can cause some response from the teacher. An example of this might be when the child touches the teacher or makes utterances to accompany this and the teacher returns the physical contact with an accompanying verbal utterance. Once this

accessibility is established then the teacher can work to improve the child's effectiveness in communicative signalling.

Intensive interaction is based on those early processes that normally developing infants are exposed to through contact with their parents and through which they acquire knowledge about themselves and about their influence on events in their environment. The importance attached to interaction in the educative process for children with pmld has been influenced primarily from teachers' own reflections on practice in the classroom and a desire to improve provision for children (Nind and Hewett, 1988, 1992, Stothard 1998).

1.5 Background

The writer's interest in intensive interaction arose through an evaluation of the school's assessment procedures used with children with pmld and the curriculum provided for them. The writer's evaluative study sought to establish how assessment of children with pmld might be related to intervention and, thus, had a curricular implication. The school already had established curriculum-based assessment, that is, using a model of core areas of development; cognition, communication, movement and personal and social development, broken into incremental steps which provided criteria for teaching children. These incremental steps became the targets for teaching and contributed to children's individual education programmes. The curriculum model on core areas of development was drawn from a number of perspectives.

1.6 School assessment of children with pmld : core areas of development

Cognition was viewed as a core area of children's development in the writer's school. It is the development of thought processes and was based on Piagetian theory (Uzgiris and Hunt, 1975). The criteria for assessing cognition was drawn from Piaget's sensory motor levels of infant development. The infant behaviours falling within the sensory motor stage and identified by Piaget were compiled by

Uzgiris and Hunt (1975) into an assessment and teaching tool. These describe early infant behaviours in a number of ways. The first of these criteria is 'visual pursuit and object permanence', that is, when infants can distinguish objects in their visual field from the background environment, gain an increasing understanding that objects continue to exist when partially hidden and when completely hidden and continue to exist in their own right. The second aspect of sensory motor functioning is the 'means infants use to achieve desired ends'. This can be described as the development of the ability to use a variety of self-directed means to obtain objects or cause happenings by releasing one object to obtain another, purposeful movement towards a desirable activity, object or person and by manipulating objects to achieve their desired end. A third aspect, 'gestural imitation' is noted as the growing understanding that other people can perform significant actions which can be imitated, also that there are actions that infants can see themselves performing, for example, clapping and that there are actions that infants cannot see themselves performing, such as sticking out their tongue. The fourth aspect, 'cause and effect' is the development of infants' ability to use a range of strategies and procedures to produce various results. Fifth is the development of 'spatial relationships'. This is the growing understanding of the relative position of objects. Finally there are the 'schemes infants use for relating to objects'. These are the variety of actions that infants use to gain an understanding of their environment.

Assessment of movement in the school was based on Presland's (1982) criteria and indicates the stages through which infants' motor skills proceed but have added criteria in the use of walking aids. The criteria are specifically focused for people with profound and multiple learning difficulties and are based on the principle that children with pmld proceed through the same developmental stages as other children but much more slowly and without reaching parity with normal developing children (Zigler 1982). The motor skills to be developed are in the

areas of supine lying, prone lying, sitting, kneeling, standing and walking. The elements relating to the use of walking aids were cited by Presland as being derived from work of physiotherapists. The criteria set are consistent with small developmental steps and thus a behavioural approach was considered to be the most useful strategy for teaching.

Communication was drawn from the developmental criteria identified by Gerard's (1976) assessment schedule which essentially was based on Bates (1979) developmental perspective of language and has a Piagetian framework. The element of the assessment adopted by the school was principally concerned with the prelinguistic stages that infants proceed through in comprehension and expressive ability.

Assessment of comprehension contains four categories. First, awareness of speech sounds and non verbal actions, that is tuning into speech and gestures. Second is joint interaction, which includes following and initiating a conversation format. Third is word understanding which includes responses to speech with actions or gestures. Fourth is environmental input, that is, giving directions to the child to facilitate comprehension. Assessment of expressive abilities also contained four categories. First, preverbal, that is communicative effects and intentional sounds. Second is verbal which includes conventional words. Third is intentional gesture which includes requests or indication. Fourth is functional communication which includes communication for various purposes.

Assessing the core area of personal and social development was school devised and principally skill-based. The source for the criteria contained in the assessment was drawn from staff's own experiences and the work of Bender et al (1978) on children's developmental progress. It included skills in toileting activity, eating, and drinking, personal care and socialisation. A multi-professional approach in assessment of eating skills also was in place and took into account the child's

posture and the utensils used. This involved speech and occupational therapists as well as the class teacher.

The evaluation of the school's assessment procedures used with children with pmld and the curriculum provided for them established how assessment of children with pmld might be related to intervention. The core areas of development outlined above, were a helpful construct to aid the assessment process. The checklists and procedures used reflected the sequential nature to some aspects of development, particularly in the area of cognition and provided criteria for teaching. However it was noted that responses of a more subtle nature evoked through an interaction process were not explicitly accommodated; specifically: turn taking, mutual attention; imitating the child, signalling the child's turn, being animated and conversational. These are features which have been highlighted by Nind and Hewett (1988, 1994) in their interaction work with people with profound and multiple learning difficulties. The theoretical model upon which this approach is drawn from cognitive psychology and is a 'natural model' (Hewett and Nind, 1988, 1994). The development in infants of communicative skill and sociability is learned within an environment of interaction with parents/caregivers. The infant is an active partner, influencing procedures as well as being influenced by them. Essentially, intensive interaction in the classroom is carried out in one-to-one situations with the teacher focussing attention on individual pupils and explicitly using those elements of interaction noted above.

However there is a broad range of behaviours that occur during interaction between adults and infants. Researchers in infant/caregiver behaviour have noted that adults touch infants during interaction (Kennell et al, 1979; Massie, 1980; Stack and Muir, 1990). During interaction smiles and overemphasised facial expressions are also a frequent feature of adults' animated behaviour (Kysela and Marfo, 1983; Stack and Muir, 1990). Additionally, intonational variations are present when adults interact with their infants (Bornstein and Tamis-LeMonda,

1990; Cooper and Aslin, 1990). Although these are behaviours commonly demanded of the parent/caregiver, their occurrence in the teacher in working with children with pmld, at whatever level, has to be observed and evaluated. The ways in which infants respond to caregivers have also been of interest to researchers, for example changes in facial expression and eye contact (Newson, 1978; Sroufe, 1979; Tronick et al, 1979). The range of behaviours that might be elicited from children with pmld through the interaction process needs to be established. This would provide additional information on children's functioning and provide for more appropriate intervention programmes.

The interest of the writer in the educative function of interaction has already been stated. In the area of communication and social development innovations in the use of intensive interaction have secured what appears to be a strong element in the provision for children with pmld. Nind and Hewett (1994) suggest that intensive interaction encourages communicative competence and sociability in people with pmld as well as reducing behaviours which may militate against those skills. This approach has been seen as providing an opportunity for teachers to influence substantially the learning in children with pmld (Ware, 1994; Watson and Fisher 1997).

1.7 Aims.

It is the intention of this study to provide further information to support the premise that intensive interaction using the broad range of behaviours outlined above can facilitate a greater quality of responsiveness and effect the learning of social routines in children with pmld. If teachers are to use intensive interaction in the classroom, then this study may provide some evidence of its worthwhileness.

The key features and behaviours present in interaction between adults and their infants will be more firmly established through an examination of the literature on infant social development. The principal areas to be examined will be the physical,

cognitive, and social implications of interaction between normally developing infants and their caregivers. The study will then identify those individual features of interaction considered by researchers, in their observations of infant/caregiver dyads, to be important for successful communication. The range of behaviours manifest in both adults and infants will be used to form the basis of a schedule which will be used to determine the frequency of occurrence of the key features in interaction between the adult and child outlined above. Those factors which impede this process in normally developing infants will also be examined. This will be followed by a consideration of the characteristics of children with pmld.Constraints on interaction for such children will be detailed. In addition, the pedagogical issues surrounding the education of children with pmld will be discussed.

The range of research methods available to this study will be discussed and will indicate the most appropriate procedure for establishing how intensive interaction influences children with pmld and the degree to which children influence the teacher's participation in the process. The analysis of caregiver/child interaction in this study will be microscopic in nature, that is the interactions will be examined in fine detail. The exchanges that occur between caregiver and child have a moment to moment dependent structure as noted by Newson (1978) each contribution of the participants determines what will follow. This requires analytical techniques which will allow the researcher to make detailed statements about the events which occur. Specific indicators from interaction sequences, which influence learning in children with pmld, will be determined.

2. An Examination of Prerequisite Features Needed in the Interaction Process

2.1 Introduction.

It is important to establish what prerequisites for interaction need to be in place with any child before any consideration of interactive functioning in children with pmld can be made. A number of important factors have been identified in the interaction process. This chapter will address the physical, cognitive and social considerations in interaction between infant and caregiver.

From birth, neonates are known to interact with their environment and have a predisposition to do so (Schaffer, 1977: Brazelton,1978; Horowitz et al, 1978; Trevarthen, 1979; Azmitia and Perlmutter, 1989). This predisposition is the mechanism through which the infant, when he interacts with the external world, grows to realise that his experiences are his own.

> It is the actions of the other to which he differentially adjusts that force upon the child the realisation that he is not the other but a being in his own right (Allport, 1969, p 28).

The infant can only succeed in interaction if conditions allow. These conditions are both within the infant and without, that is, in his social environment. Infants must have some physical capacity to signal communicative actions, for example, the ability to move facial muscles that might provide meaning to the caregiver. In his cognitive functioning the infant must have a degree of contingency awareness which provides a motivational aspect to interaction. In addition to these two conditions, social circumstances must be such that the infant wants to initiate interaction and to maintain it with an interactive partner.

2.2 Physical considerations.

Interaction between the infant and caregiver is a dynamic process which involves a whole range of physical manifestations, requiring a degree of control in the infant.

Infants need to be able to move those facial muscles which enable them to shape their mouths for the various communicative signals that the face gives. Motor coordination of the vocal chords is necessary to produce sounds and the child's respiratory mechanisms need to be functioning adequately to enable sounds to be controlled (Trevarthen, 1979; Crystal 1980). During interactions, the infant needs to be able to move his head to gain and give information. An infant's head adopts many positions during interaction and these are often in combination with a range of facial expressions; there is in fact, a set of patterns in general body expression. Trevarthen (1979) notes that movements of the hand are linked with facial expression and the use of some speech sounds.

Examinations of interaction between infants and caregivers have noted the need for infants to have physiological control so that they can imitate the caregiver's behaviour. Bernieri et al. (1988) has suggested that there is a synchronous nature to interaction, that is, a degree of congruence existing between the adult's and infant's behaviour. Posture, limb movement and facial expressions occur in cycles of engagement and disengagement; there are periods of mutual attentiveness followed by one or other of the interactants terminating the interaction and the other makes attempts to re-establish the interaction.

Observations of infants and caregivers have shown that infants need to have a degree of physiological regulation, for example, having a sleep-wake cycle. Caregivers, in order to promote this have a role in providing smooth routines to aid infants in coming to terms with their physical states and to assist their physical development (Sroufe, 1982). Here the caregiver provides support proportionate to the child's skill. The physiological aspects of interaction, that is, the range of limb, facial and postural movements which are taken as signals of a communicative nature by the caregiver, contain the cues that caregivers need to perceive to make appropriate responses (Vedeler, 1987). There are a range of such movements, for example smiles may be seen as contact seeking and squirming may indicate

discomfort. Sroufe (1979) notes that early on in infancy a child's behaviour is greatly influenced by the physiological context of whatever stimuli is being presented.

Physiological maturity influences the onset of vocalising. The size of the tongue, its elasticity and musculature and the ability to exercise respiratory control, are of particular importance (Papousek and Papousek, 1984; Wulften-Palthe and Hopkins, 1984). By the time they reach the age of three months, infants have acquired the physical characteristics and gained a level of control to produce cooing sounds. When infants have gained some control in their posture, and their head and eye movements are co-ordinated, they have wider opportunities to engage in social interaction (Trevarthen, 1979; Papousek and Papousek, 1984). Should these functions become impaired in infants' responding behaviours, caregiver responses may be restricted and this, in turn, will affect the quality of interaction and social and cognitive development would suffer (Wulften-Palthe and Hopkins, 1984). Children would not necessarily receive the additional compensatory stimulation that caregivers would need to produce in interactions with their infants. This issue, however will be addressed in detail later.

Infants' responding behaviour is heavily influenced by the physiological context in which stimulation occurs (Sroufe, 1979). The infant's state of arousal is important for his openness to stimulation. Arousal here is noted as 'the drive state that maintains our capacity to perceive sensory events and exert mental effort' (Solso, 1991). The levels of arousal in infants vary according to the routines such as the sleep-wake cycle, they have developed. Schaffer (1977) notes that although infants were thought by psychologists and researchers in infant behaviour, to have prolonged periods of sleep, this is now considered to be inaccurate and cites finding by Parmelee et al. (1964) that infants, including new born babies, are awake for about one third of the day. Infants of one week old have been found to sleep on average sixteen hours and this reduces to fourteen hours by the time they

reach four months of age. These periods of sleep are not continuous but are broken up throughout the day and night in a rhythmic fashion. Their levels of arousal vary and this reflects on their ability to apprehend events, and be stimulated by them (Brazelton, 1978). This is evident if one examines the five levels determined by Prechtl and Beintema (1964). At the first level there is deep or regular sleep indicated by lack of movement and regular breathing. Then there is active sleep with the child breathing irregularly and producing slight twitches. A third level sees the child awake, alert but inactive, with no gross movement. A further level of wakefulness shows alert activity with some movement and irregular breathing and, finally, at the highest level the child is crying and showing gross movements. The rhythmic qualities of the infant's level of arousal may be seen in the way in which infants suck. The infant sucks in a burst-pause pattern when sucking on a 'pacifier', that is, the infant sucks vigorously for a period, stops for a time and then resumes vigorous sucking. But burst-pauses do not occur so clearly when the infant is sucking for nutrition, there is a degree of burst-pause but the pauses are short. Sucking is also linked to other physiological functions and it controls, for example, swallowing and breathing (Schaffer, 1977). This feature of burst-pause also occurs in the child's interaction with his mother. Schaffer (1977) notes that a six month old's attention to being taught how to reach a toy obscured by a barrier, reflected the same burst-pause pattern. Clearly the infant is predisposed towards pattern in various aspects of daily living and an awareness of this, will aid the caregiver when encouraging communication.

It can be seen then, that the infant's physiological capacities impinge on their ability to interact with others. Their levels of arousal need to remain steady and they need the physical capacities to signal communicative intent or at least to display a range of physical behaviours that can be read by the caregiver.

2.3 Cognitive Considerations

Communicative exchanges between the infant and caregiver are active events with

each participant having an active role. Observations of adult/infant interaction show the infant to be an equally active participant in the process and not a passive malleable recipient of adult moulding (Schaffer, 1977). The infant has personal features such as his smile, which he presents in his interactions and which influence the responses offered to him. The caregiver's perception of the child's level of cognitive functioning is influenced by these features and thus responds in different ways dependent on the age of the infant. This might be seen in the variation and difference in responses a caregiver makes to a six month old infant compared with a new born infant.

Trevarthen (1979) notes that in dyadic communication between an infant and caregiver, there is a sharing of control in the process. For infants to exercise control they have to exhibit a sufficient level of awareness and the capacity for intent. They have to show attentiveness and anticipation to events in their environment and make some attempt at exploring objects in the environment. These are the features that one may see in infants of one or two months of age. There is also a requirement that the infant makes some manifestation of enjoyment, purpose and prediction, and a capacity to see some relation between events in their environment and themselves.

From birth, infants have an emerging capacity to appreciate symbols and the development of this relies on linguistic and non linguistic elements (Bates, 1979). The symbolic aspects of interaction in infants up to the age of about eight or nine months, are in their early stages. The child experiences these through the ritualised games that the caregiver plays with him. The symbolism of the caregiver holding out a hand to an infant holding a toy and saying "thank you" as part of a 'give and take' game is an exemplar of this. However, the language that is used by adults in interaction with infants, does not have to be fully understood by the infant. The only requirement is that the infant makes responses which are significant enough to make the caregiver continue with communicative acts (Newson, 1978). From a

behaviourist perspective, that is, one which assumes that most if not all human behaviour is acquired or modified through learning procedures or environmental experiences (Molloy, 1985), this process can be seen as contingency analysis. The infant gains confirmation that a contingency exists between his own behaviours and the responses and attention given by the adult (Watson, 1976; Azmitia and Perlmutter, 1989). The behaviour of competent adults or others, acts as a reinforcer on the infant's communicative behaviour. The infant's social skills may be enhanced through improvements in his responses to attention, but this does not necessarily lead to greater accuracy, that is, making of appropriate responses interaction.

For the infants to improve their accuracy in interactive skills, they have to have a sufficiently developed level of discriminatory skill. For them to respond in an appropriate manner and to maintain the caregiver's attention, infants need to be able to discriminate from the behaviours that the caregiver displays, those features that need a response to keep the caregiver interacting. It has been suggested that infants under five months of age are not as good at reading less obvious emotions such as sadness, as this requires a high level of discrimination (Caron et al, 1988). Furthermore, discernment of joy and anger is not evident in infants at five months of age, but does appear after this time up until seven months of age. Caron et al (1985) also suggest that voice rather than the face, is more evident in transmitting to infants the emotions of the other. However, a contrary view proposed is that infants within the first six months of life have a discriminating capacity when looking at a range of different facial expressions. By the time infants reach the age of six months, a range of affective responses are evident for example smiles in response to smile.When caregivers exhibit particular moods through facial expressions these can be read by the infant (Gusella et al, 1988). The research by Gusella et al (1988), shows that when caregivers adopt a still face, exhibiting no affective features, there is a decrease in smiling and gazing by the infant. This further confirms that discriminatory behaviours are evident at an early age.

Infants operate in interaction with a number of limitations. Their rate of processing incoming information is slower than adults as shown from observations of infants playing with objects of interest. When such objects are obscured by a screen they cease to exist for the infant because the occurrence happens too swiftly for them to process the action as an obstruction to their vision (Tronick et al, 1979). Because infants have immature perceptual abilities, they are unable to separate the temporal and spacial elements in an activity and therefore view it as one event (Tronick et al, 1979). The use of language by the adult in interaction aids the maturity of perceptual abilities in the infant. Cullingford (1988) proposes that words create images, thus, the use of language in interaction creates images for the child. A pet name may be given for a favourite toy, for example, and with continued use, the name of the toy will create the image of it for the infant For adults this is a subconscious process but for infants the distinction between subconscious and conscious thought is not so clear (Cullingford, 1988). Although the infant is a novice in language capability, the interaction he has with his caregiver gives him opportunities for discovering the principles of communication, such as, exchanging communicative signals, turn taking and intentionality (Wells, 1986). It has been noted that care givers select certain of the infant's early gestures, such as, 'hand flapping', and vocalisations on which to infer intentionality, others are not deemed to have coherence and relevance (Newson, 1978; Vedeler, 1987). Caregivers act as if there is meaning in the infant's behaviours and these become meaningful for the child.

2.4 Social considerations

The context of the interactions between infant and caregiver has been recognised as important for successful exchanges which provide the infant with opportunities to gain competence in communicative skills. Howe (1981) suggests that every interaction sequence has three elements. First, there is 'address', or the directing of remarks from one person to another. The second element is the 'topic' which

provides a focus for conversation such as some object of interest to the child, perhaps a favourite toy. The final element is reply or response which is constrained by the nature of the previous two. These elements can be found in every interaction between the caregiver and the infant of only a few hours old up to fifteen or eighteen months old for example, during feeding, washing, play, toileting and dressing. Within these elements recurring features are evident. During interaction a number of strategies are used by caregivers within each of the above elements. Labelling is one such strategy, where the caregiver names items to which the child has directed interest. Caregivers have been seen to point out features of objects to their infants. Another strategy used by caregivers is questioning of the infant about himself or the objects of interest. A third strategy is the giving of information to the infant about the object of interest (Halliday and Leslie, 1986). These strategies are used to provide the infant with opportunities to extend his understanding of the environment, and to improve communicative abilities.

Caregiver sensitivity is important in any interaction with infants. Adults make judgements about the signals that infants make and use these as cues for action. The quality of responsiveness depends of the caregiver's ability to link into the child's signals, give an interpretation and make swift and appropriate responses (Ainsworth et al, 1974). The caregiver needs awareness and empathy in order to interpret accurately the signals from the child. If these elements are in place then the interaction is motivating for both adult and infant.

The responsivity of caregivers to their infant's attempts at interaction provides a 'scaffolding' role (Bruner, 1976). Caregivers provide support and mediation in the interaction process, relative to the child's skills. The degree of mediation caregivers provide in alerting the infant to events in the environment depends upon the responsivity of the infant (Vandell and Wilson, 1987). Responsivity in this sense is judged in terms of vocalising, attentiveness and other non verbal signals which indicate to the caregiver that the infant is open for interaction. It has been found

that, where infants have a lower responsivity to situations, a high level of caregiver mediation is necessary. Where infants are easily raised to high levels of responsivity, a low level of mediation by caregivers is necessary (Parinello and Ruff, 1988). Another important feature identified in the process, is that caregivers use pauses in their exchanges with infants. The pause is as important as all the other features of the interaction as it allows the infant to assimilate information being given and to organise his response (Nind and Hewett, 1994).

It has been noted that caregivers interact with their infants in a synchronous way, adjusting their behaviour to the child. This feature occurs more frequently with related for example, parent and child, rather than unrelated adult and infant pairs (Bernieri et al, 1988). The reasons for the greater synchrony observed in interactions between related pairs may, however, be due to the familiarity which exists between them, as infants may not respond in the same way to comparative strangers. It was noted in this research that the lack of synchrony between unrelated participants increased over a more lengthy exchange as the adult was unfamiliar with the infant's interactional behaviour. However, it may be the case that the rapport between strangers and infants can develop, given time for each to become familiar with the other.

Caregivers generally show an understanding of the limitations of the infant during interaction. Caregivers are often the most successful participants, gauging the best time for engaging infants in communicative activity and making judgements about the time limit of interactions (Tronick et al, 1979). Caregivers use repetitive vocalisations and over emphasis in expressions as they tune into their infant's abilities. It has been noted that even though caregivers are sensitive to their children's interactional capabilities, they cannot synchronise routines perfectly as infants do not have an exact activity procedure which is readable by the caregiver. Caregiver responses may occasionally have flaws in the timing and rate and may

not, for example, always give the infant sufficient opportunity to respond. This would mean that the regular rhythm would then be lost and the infant would need to take a leading role and re-establish the flow. It is a problem solving process for the child.These flaws make the interaction process a little more complex and require adaptation by the infant. Whilst the predictability of an interaction sequence allows the infant to take an active part, these slight flaws develop his scope of responses (Tronick et al, 1979).

This is of relevance to the teacher of children with a profound developmental delay as many of these children do not appear to have the skills or the capacities to make use of the social situation and adults for their part, may not have been able to synchronise their behaviour to the child's and scaffold appropriately to their level of development. It is necessary, therefore, to examine the infant/caregiver interaction in more detail.

3.Infant/Caregiver Interaction - Specific Features.

3.1 Introduction

A number of features occur repeatedly in interaction between infants and caregivers. These include the individual adult and child behaviours, as well as other common features which are part of the combined caregiver/infant exchanges. These are mentioned briefly below and will be addressed in some detail further.

Adults have been noted to touch infants frequently when engaging them in interaction. (Kennell et al, 1979; Massie, 1980; Stack and Muir, 1990). Smiles and exaggerated facial movements, or overemphasis of facial expressions are a frequent adult feature (Tronick et al, 1979; Kysela and Marfo, 1983; Vandell and Wilson, 1987; Stack and Muir, 1990). When adults vocalise in interaction they use different intonations (Kennell et al, 1979; Tronick et al., 1979; Massie, 1980; Howe, 1981; McCollum, 1984; Bornstein and Tamis-LeMonda, 1990; Cooper and Aslin, 1990). 'Games of the person' such as 'peek a boo' are another recurring feature (Sroufe, 1979; Howe, 1981; Stack and Muir, 1990; Wolock, 1990). Adults frequently place themselves en face with infants when interacting (Schaffer and Crook, 1978; Kennell et al, 1979; Massie, 1980; McCollum, 1984; Schaffer and Liddell, 1984; Wulften-Palthe and Hopkins, 1984; Bornstein and Tamis LeMonda, 1990). Adult imitation of infant behaviours such as facial expressions and vocalisation also occurs (Trevarthen 1979; Tronick et al 1979; Halliday and Leslie 1986).

Infant behaviours manifested in interaction include changes in facial expression (Newson 1978; Sroufe 1979; Tronick et al,1979; Wulften-Palthe and Hopkins, 1984; Stack and Muir 1990). Eye contact with adults has been frequently noted by researchers (Newson 1978; Kennell et al., 1979; Tronick et al, 1979; Papousek and Papousek, 1984).

Infants have been observed to signal communicatively, using posture changes

(Sroufe, 1979; Trevarthen, 1979; Tronick et al., 1979;Papousek and Papousek, 1984;). Vocalisations, for example the production of vowel sounds, also occur in exchanges with adults (Bates, 1979; Trevarthen, 1979; Tronick et al, 1979). When infants interact with caregivers there are evident modes of attentiveness and anticipation (Parinello and Ruff, 1988; Gussella et al, 1988).

Exchanges between the caregiver and infant have been seen to have rhythm, exhibited through imitation and turntaking (Tronick et al, 1979; Kysela and Marfo, 1983). Additionally it is suggested that the process has synchrony and the participants manifest reciprocity (Tronick et al, 1979; Lester et al, 1985; Halliday and Leslie, 1986; Bernieri et al., 1988). Caregiver sensitivity to the behaviours displayed by infants has been noted (Ainsworth et al, 1974; Tronick et al., 1979; Parinello and Ruff, 1988; Smith and Pederson, 1988). There is also evident in caregiver behaviour, the attribution of meaning to the infant's signals (Shields, 1978, Vedeler, 1987; Wells, 1988).

3.2 Adult Behaviour.

Touch has an important function in caregiver/infant interaction. Adult touch serves to reassure children who are uncertain about other signals they perceive from them. For example, if adults have an expressionless face when talking to children, it has been found to be distressing and often results in grimacing, gaze aversion and general reduction in smiling by the child (Stack and Muir, 1989). However, it has been suggested that caregivers, even with an expressionless face, can evoke engaged behaviour from infants if they use touch. The quality of touch, whether mild or intense is sufficient to reduce the stress of the adult's 'still' face (Stack and Muir, 1989). In order for caregivers to persist in interaction with their infants, they need to have bonded with them (Ainsworth et al,1974). The bonding process, where children and caregivers develop a growing attachment, is an essential process for developing in the child a sense of himself (Kennell et al., 1979). Continual touching is seen as an aid to this process (Massie, 1980) . Hence touch is a motivating factor

in interaction, as the child is encouraged to continue to interact with and attend to the adult. The mode of touching used by adults is generally a gentle stroking of the infant's face, but also ranges from mild movements such as touching or lifting hands, or feet, to intense touches like tickling. The level and quality of touch depends on the state of the child, the stage and goal of the interaction and the relationship existing between the child and caregiver.

When interacting with infants, adults continually use facial expression and smiles. The face is the child's first focus for seeking information, providing entertainment and reassurance. Smiles provide the infant with reassurance and adults engage in a form of state setting. The use of smiling aids in orienting the child to the adult's face. This also encourages the infant to continue looking at the adult, maintaining his focus of attention (Tronick et al, 1979). The importance of this form of adult expression has been illustrated in numerous studies. Mothers who present a 'still', or expressionless face to their infants without providing any physical contact, produce distressed behaviours as has already been noted (Stack and Muir 1989).

When adults have animated facial features during interaction, they can evoke in infants a wider range and longer period of engaged behaviour, including eye contact and reciprocal smiles (Stack and Muir, 1989). Caregivers create exchanges with infants by responding contingently to their behaviour (Vandell and Wilson, 1987). They use a number of social and non social acts to engage the child. The vocal responsiveness of caregivers is a factor which influences infant's attentiveness and assists them in making contributions to the interaction. Adult vocalisations provide cues for the infant and provide opportunities for learning communicative styles.

Mothers use 'baby talk' to initiate interaction with their infants (Tronick et al, 1979) . This is one of the principle strategies used to gain and maintain an infant's attention. Once the child attends to the caregiver, the caregiver's vocalising becomes smooth

and modulated. Caregivers use their vocalisations as marks of encouragement for the infant to respond in a vocal manner and this becomes a play dialogue (Tronick et al, 1979). Play dialogues and infant directed speech have a number of specific features. This type of adult vocalisation has been found to have fewer words per utterance and frequent repetitions of words. The adult's articulation is clearer and the structure of utterance is simplified (Cooper and Aslin, 1990). There is a change in prosody, with the pitch of the voice being higher and the pitch contours more distinct. The tempo is slow and pauses between utterances are lengthened (Howe, 1981). Adults also increase their emphasis on words. It has been found that continual use of high pitch does not have strong attention gaining features, unless gaze is involved. It is also necessary for the adult to be looking at the infant and have eye contact. Infant directed speech or the infant register is facilitative and provides a scaffold for the infant's communicative development. It enhances listening skills, and maintains infant attention. The rising contours in pitch do this whilst falling contours maintain interest. Infants find it easier to detect the adult's affective mode and meaning when 'infant register' rather than 'adult register' speech is used (Howe, 1981; Jones and Adamson, 1987).

Infants operate at different levels with respect to the amount of adult intervention necessary to evoke responses. Low responsivity in infants has been found to need a higher level of intervention (Parinello and Ruff, 1988). Vocalisations from adults need to have a specific level and period to retain infant attention. It has been noted that infant attention is episodic and that too high a level, which includes periods of vocalisation, is counterproductive. However, some infants whose state of alertness may need heightening need a high level of intervention.

As well as using vocalisation, caregivers use physical procedures in interaction with their infants (Bornstein and Tamis LeMonda, 1990) and this makes the infant receptive to sensory input. When adults play 'games of the person' which involve moving the child's body or using coactive movement in rhyming games such as

'wind the bobbin up', this provides a scaffold for the infant to learn social skills. Adults often use caregiving activities as opportunities to engage in play movement and these provide the topic for the adult to use and interact with the child (Howe,1981). Tactile stimulation is an important feature in interaction. Play movements of a mild or intense nature help to reassure the child, when other signals coming from the caregiver may be disturbing (Stack and Muir, 1989). Adults often engage in games of the person such as 'peek a boo' which follow a set pattern and allow the infant to anticipate surprise. Whilst enjoying these games, the infant learns to coordinate sensory input (Sroufe, 1979). Play movements are also a method of tutoring infants, providing a physical support and encouragement as well as feed back.

Caregivers have been observed engaging in a series of activities which are a preparation for uninterrupted interaction. Looking behaviours are one means adults use to establish and maintain interaction with infants. The mode of looking may be neutral or bright.The participants in interaction adopt an 'en face' position as part of a state setting activity (Tronick et al, 1979). Howe (1981) notes that caregivers utilise gaze in interaction as an essential element, when addressing infants. It suggests availability for engagement and play and is seen in most aspects of caregiver/infant activity, such as toileting, washing, dressing eating and drinking. As with other features of interaction, adults use the en face position to motivate infants and to enable them to receive facial signals. Infants tend to habituate to this, that is, the novelty of the situation subsides, and the period of en face gazing decreases. Generally, caregivers attempt to retrieve the infant's gaze by making a game out of looking. The resulting infant behaviour tends to be alternating which urges the adult to keep the game going (Wulften Palthe and Hopkins, 1984). When caregivers show a neutral gaze to infants without additional reassuring behaviour, such as touch, the child no longer attempts to maintain the adult's attention (Stack and Muir, 1989). This has been observed in mothers who are depressed and have not sustained their gaze with infants (Bettes, 1988).

The motivating factors in an infant's early learning experiences help to facilitate cognitive development. The affective aspect of interaction with others provides this motivation. The infant has to read the affective signals from the adult's face as well as the tone of voice (Sroufe, 1979). The en face position required for affective interaction between infant and caregiver aids the bonding process (Kennell et al, 1979; Massie, 1980).

Caregivers frequently imitate their infant's behaviours. They have been observed to pick out the child's prominent mannerisms, such as head and facial movements, and imitate them, but in an exaggerated way (Trevarthen, 1979). They do this almost subconsciously and it has an impact on the infant's perception of the social environment (Tronick et al., 1979). The process assists in giving the infant signals about reciprocity and its importance in social exchanges. It has been noted that adults will repeatedly imitate the infant's vocalisations, but then introduce a 'mismatch' such as head shaking, to alert the child to a change in the process to which he has to adapt (Halliday and Leslie, 1986; Trevarthen, 1979).

3.3 Infant Behaviour

Facial expressions used by infants are an indication of their changes in state and this signals to the caregiver the action required. The infant's grimaces in response to the caregiver's 'still face',observed by Stack and Muir (1989), required the caregiver to perform another action, touch, to get the infant to return to smiles. The facial expressions adopted by the infant also encourage the caregiver to vocalise (Newson, 1978). Smiling is a feature of maturation, and its onset varies from child to child. Some children first display it as early as four weeks and others as late as fifteen weeks and its frequency appears to increase by eighteen weeks (Wulften Palthe and Hopkins, 1984). This concurs with Sroufe's (1979) view that smiling is indicative of a level of understanding which is necessary for interacting with others in a meaningful way. Initially, smiling occurs as a response to any stimulation that

arouses the infant. Smiling that occurs at the later stage, when the infant is more attentive, is broader but has a shorter duration. With increased involvement in the environment, the infant smiles more vigorously. Smiling is a frequent expression which occurs and becomes a significant element in interactional exchanges, as it maintains positive caregiver attention (Sroufe, 1979; Tronick et al., 1979; Wulften Palthe and Hopkins, 1984).

Eye contact is a significant element in the infant's repertoire. Establishing eye contact with the caregiver provides its own reward for the infant. It is used to initiate interaction and to maintain the caregiver's attention (Newson,1978; Kennell et al, 1979; Tronick et al, 1979). However, infants need to develop competence in observation in order to learn. This is encouraged through attention getting behaviour such as eye contact and it is the precursor to looking jointly with the caregiver at other things in order to learn about them (Papousek and Papousek, 1984).

Neonates' (children in the first few weeks of life) early reactions to stimuli are with whole body responses. With adequate support neonates have been seen to perform a wide range of head movements in response to stimuli (Papousek and Papousek, 1984). Their whole body responses become more coordinated as they grow older (Sroufe, 1979). Postural changes are part of a pattern of innate mannerisms. Infants have been observed to make postural changes with accompanying facial expressions (Trevarthen, 1979). The infant makes changes in his posture to greet the caregiver. This engages the caregiver who becomes animated in response to the child's activity (Tronick et al, 1979).

The appearance of vocalisations in infants varies across age groups. The first positive non-crying vocalisations are easily evoked by caregiver attention and speech, as well as the introduction of toys or objects of interest (Trevarthen, 1979). Neonates have the intention to speak, well before their physiological mechanisms can produce the sound. Lip and tongue movements have been observed by

Trevarthen (1979) and these have been inferred as intent to vocalise. When infants vocalise in the presence of caregivers, it is often an attempt to engage the caregivers in interaction. This has been noted by Tronick et al (1979) with infants whose caregivers are present but do not face them. However, Bates (1979) suggests that communicative intent develops with the child's understanding of using a means to obtain a goal. When neonates cry they are unaware of the signal value of the behaviour, but are simply responding to a physiological state.

When infants imitate an adult's physical behaviour they use movements from their existing repertoire rather than novel ones (Uzgiris, 1972). It has been noted that infants imitate a range of adult behaviour. Infants under one month for example, imitate adult facial expressions, but this declines between the second and fifth month. However, deliberate imitation of vocalisations occurs in the fourth and fifth month (Maratos, 1973). Neonates also have been observed to imitate adult hand gestures and facial expressions (Meltzoff and Moore, 1977). The capacity to imitate others is dependent on the infant's cognitive development and they cannot perform imitations unless they have some concept of the 'person' (Trevarthen, 1979).

3.4 Combined adult/infant behaviour

The development of attending behaviours is important if infants are to learn about their environment. They become attentive through animated features in the environment. Infants are more attentive to features with movement than those which are static (Gussella et al, 1988). If caregivers use language to describe, indicate or highlight the properties of objects or events they have to make judgements about the levels of intervention necessary to gain attention. The ease with which infants respond to adults attempts to evoke their attention, varies from child to child and according to the circumstances. Parinello and Ruff (1988), in their study of attention in children with high and low responsiveness to stimulation, suggest that low responding infants need higher levels of stimulation. Furthermore, they note that children with low responsivity to the presentation of objects, are more attentive to

social aspects of the activity. They also determined that children need intervals in the attention getting process so that information could be assimilated;

> .."pauses are as important as the actual episodes of attention to the process of exploring and learning about objects" (Parinello and Ruff, 1988 p1133).

It has been reported that some infants may not be as sensitive to the visual and auditory aspects of interaction as previously thought. They need the additional prompt of adult touch to gain their attention (Gussela et al, 1988). It has been shown that interactions between infants and caregivers have rhythm or cyclicity and synchrony. Trevarthen (1979) suggests that this is evident in the way in which infants imitate adult behaviours.

Infant/ adult interaction have been observed to have rhythm. The rhythm can be seen in turn taking activities which seem to develop naturally (Halliday and Leslie, 1986). Lester et al (1985) in their study of three to five month old infants and their mothers found a sequential cyclical nature to their interactions. The cyclical nature of interaction has also been noted by Tronick et al (1979). It follows patterns involving a combination of up to five aspects of interaction. The first is initiation, where either the infant or the caregiver alerts to the other. For example when an infant first sees the caregiver the infant may exhibit changes in facial expression. Similarly the adult may exhibit expressions to show the child that he has been noticed. The second is mutual orientation, where each participant exhibits some attending behaviour such as vocalising. Thirdly there is a greeting phase which involves looking behaviours in combination with some movement. The fourth is play dialogue and this tends to be vocalising on the part of the caregiver in burst-pause phases. Finally, there is disengagement as either the infant or the caregiver gives some indication of termination of the interaction. There is an element of predictability in this process, which enables infants to establish some prelinguistic structure in their communicative skill (Lester et al, 1985). It also illustrates to the participants levels of interest and approval (Bernieri et al,1988).

When infants vocalise, change their posture, or make facial expressions, they do not always intend meaning. However, caregivers often infer meaning from some of the infant's activity. (Vedeler, 1987). Trevarthen's (1979) analysis of mothers with their two month old infants, confirms that they are often interpretive of the infant's behaviour and place meaning on it. The attribution of meaning to infant's behaviour, particularly vocalisations, helps to form communicative skills, because it is motivating for both child and adult (Wells, 1988) To learn from and participate in interaction, the infant needs to develop sophisticated communicative skills. These in their turn, facilitate the development of cognitive schemes about others and their relationship to themselves. They also help to develop understanding about relationships with others and the environment (Shields, 1978).

3.5 Barriers which interfere with the success of interaction.

There are features occurring in both infant and adult performance which impair successful exchanges in interaction. Where conditions interfere with the vocal responsiveness of caregivers, there are contingent effects on the infant's behaviour. For example, mothers who are depressed take a longer time to respond to their infants and the infants read this temporal lag as a disengagement. When depressed mothers do respond to their infants, the intonational features of their vocalisations are not evident and the infant does not have the signals necessary to respond appropriately (Bettes,1988).

There are situations where caregivers have more that one infant with whom to interact such as playgroups or nurseries. In these contexts constraints on interaction become evident. Research carried out by Schaffer and Liddell (1984) has shown that when adults have to interact with infants as a group, there is reduction in interaction on an individual level. As a result, adults adopt coping strategies and have been observed to be more directive. In addition, there are increased demands on the adult as each child competes for attention and so the process becomes

fragmented, that is, the flow that may be evident in dyadic interaction where there is attentive and continual reciprocal behaviour in both partners, is broken by other children's attempts to engage the adult. There is also a reduction in the adult's participation in the child's activities. Consequently, the child's perception of the adult as a caregiver is affected. Whilst adult speech increases during interaction with a group of children, this does not compensate sufficiently for the reduced attention to individual children. The adult uses the coping strategy of ignoring a high proportion of the child's attempts on his/her attention. This ignoring behaviour has been found to be three times as high in interaction with groups, as with dyads. However, some compensatory action is taken. Adults in these circumstances make some attempt to reduce the adverse effects of interacting with groups of children. When adults do respond to children who are in a group, their responses are almost always appropriate (Schaffer and Liddell, 1984). In the situation where adults have to interact with a number of children they do so as series of dyads. There are fewer utterances which are addressed to the group as a whole. Adults attempt to maintain the dyadic style by using the child's name frequently, as well as the frequent use of visual signals.

Infants interact best when they are not anxious and insecure (Smith and Pederson, 1988). Levels of security and anxiety can be influenced by a number of factors. Attachment behaviours that are exhibited through interaction are important in making the infant secure (Ainsworth et al., 1974). The infant needs to know that the caregiver will respond to his bids for attention even when they are working on a task. When caregivers give their full attention to infants they feel secure. If caregivers continue with tasks which draw their attention and do not respond to their infants, then they may become anxious. A similar result was found to occur even if caregivers attempted to give responding cues to their infants but continue to focus on particular tasks (Smith and Pederson, 1988).

3.6 Conclusion

As already noted, the abundant research related to caregiver interaction carried out with populations of children of normal development, provides the foundations for work with children with pmld. It is established that through such interactions communication skills are learned and general development enhanced and that skills and techniques used by caregivers draw the child into active participation in the process (Newson,1978; Bretherton et al, 1979; Trevarthen, 1979; Tronick et al, 1979; Azmitia and Perlmutter, 1989). It has been assumed that the skills and techniques work analogously with children with pmld. This view is based on the premise that children with learning difficulties proceed through the same developmental sequences as other children albeit at a much slower pace and with a lower developmental ceiling (Weisz et al., 1982; Lister et al,1989; Zigler and Hodap, 1991). However, it is suggested that this similar sequence in development is only evident in children who are not organically impaired, that is, no physical cause such as Down Syndrome is present (Zigler 1982). This argument has been contested. Ellis and Cavalier (1982), for instance, have noted that children with learning difficulties who show similar developmental sequences may indeed be organically impaired but the aetiology remains undetected. This seems to underline the difficulty in detecting aetiology reliably and enhances the possibility that children with pmld follow similar developmental paths to other children who are at prelingual levels but within the limitations already noted. If this is the case then the enhancement of interaction will have measurable benefits for them. It would seem essential then to determine whether communicative behaviour can be established with children with pmld and that those interaction skills which will aid development can be utilised appropriately

Before embarking on such a study it is necessary to detail the characteristics of children with pmld and to consider possible constraints on interaction as a result of their difficulties. This will be carried out in Chapter Four.

4.The Characteristics of Children with Profound and Multiple Learning Difficulties.

4.1 Introduction

This chapter will examine the characteristics of children with profound and multiple learning difficulties. It is necessary to identify the significant features which determine children as having pmld, in order to establish those differences which may indicate any absences of the prerequisites, and specific features of interaction, and thus inhibit their opportunities for interaction. It will do so by reviewing the testing procedures used to describe children with pmld. Comments about their appropriateness will be made. The implications of medical/clinical features which contribute to the picture of profound and multiple learning difficulties will also be considered indicating the constraints on children with pmld in the interaction process.

4.2 Test criteria used to identify children as having pmld.

There have been many attempts to establish a set of criteria which would identify children with pmld, despite the heterogeneity of this group. Initial diagnostic and classificatory approaches used psychometric testing, that is, determining levels of intelligence. This process presupposed that 'intelligence' is a measurable thing. and the function of the intelligence test was to determine how well children will do in school learning (Stones, 1979). Moreover as Stones (1979) points out 'intelligence' is a construct where there is no general consensus as to what its nature really is. This has been, and to some extent still is, considered an exact method for assessing and describing children with pmld. The Ford Castle Working Party on Profound Mental Handicap defined individuals as being profoundly mentally handicapped if they function, as far as can be assessed, at an IQ level of less than twenty/twenty five IQ points (Seminar Paper 1983) where the average child is expected to score around one hundred points. The reference to IQ tests by such an influential group suggests that this type of test is an appropriate method of categorising children with

pmld. These intelligence tests, for example the British Ability Scales, have been standardised through administration to large populations. An IQ score of one hundred is set as the average with a standard deviation of fifteen or sixteen points. IQ tests have been extensively used in the past but their reliability with children with sld and pmld is questioned by experts in the field of pmld (Hogg and Sebba, 1986, Berger and Yule, 1987). A primary concern is that children with pmld were not included in the original sample when the tests were being standardised (Hogg 1987), that is, performance levels in a test are determined through its administration to a large number of children for whom the test is intended (Stones 1979).

Standardised developmental scales, for example the Bayley Scales of Infant Development and the Griffiths Developmental Scale are often used with children with pmld. These scales are designed to yield a mental age (MA) for children. The Mental Age of a child is determined from the stage at which most children can solve the 'test' problems (Pickard 1970). For example if a child at chronological age (CA) of seven years solves problems at which most would not complete until their ninth year, then one might say his mental age is two years above average. When a child is scored as having a mental age of one quarter or less than their chronological age then they are considered to have pmld (Hogg and Sebba, 1986). Beail's (1985) study is an example of the use of such scales. This was a study where both the above scales were used with twenty five individuals with profound and multiple learning difficulties, whose ages ranged from three years to twenty one years. On the Griffiths Scale, the children's mental ages ranged from one month to fifteen months and on the Bailey Scale their mental ages were determined at between one month and thirteen months. This study is illustrative of the developmental levels ascribed to children with pmld.

The use of Piagetian assessments as a means of establishing a child's developmental status is common in special schools. These assessments have been derived from the developmental theories of Piaget (Hogg and Raynes 1987). The

Piagetian perspective of development views the nature of change within individuals as transformational, that is, there are qualitative changes in the competencies that an individual has. These occur in stages which have an inter-relatedness between them (Uzgiris and Hunt 1975). The Piagetian approaches used in special schools are principally concerned with the sensorimotor or early stages of development through which infants progress. Criteria are derived from types of behaviour or traits which children manifest as they proceed through the different stages of development. The principal assessment utilised by schools has been Uzgiris and Hunt's Ordinal Scales of Infant Development (1975). The version which predominates currently is Dunst's (1980) derivative. This version specifies criteria across each of the six scales: Object Permanence: in this aspect of development the infant gains an increasing understanding that objects remain in existence even when they are out of sight. Means end: the infant develops an awareness that he/she can use various means to obtain a desired environmental happening. Vocal and Gestural Imitation: in this area there is growing awareness of the linguistic and gestural actions of others and a developing desire to copy these. Causality: this is the understanding in the infant that actions performed by him/her can have an effect on their environment. Spatial Relationships: at this level the infant gains a growing appreciation of the relative positions of objects to himself and to each other. Schemes for Relating to Objects: the infant develops a range of exploratory actions on objects and thus gains an understanding of their properties. In Piagetian terms children with pmld will, developmentally, always remain in the sensorimotor stage. Goldbart (1994) uses a Piagetian perspective to characterise children with pmld. She suggests that these children are pre-intentional communicators who make slow progress in gaining intentionality. Observations of children with pmld show that they generally exhibit 'primary circular reactions', in other words they tend to engage in 'inward', self stimulatory behaviour. In order to be intentional they have to exhibit 'secondary circular reactions', which entails acting on objects in their environment in particular ways in order to maintain arousal. Kahn's (1977) study provides a further example of this as sixty three profoundly handicapped children whose ages ranged

from three and a half years to ten and a half years were found to be functioning at sensorimotor levels. In another study, Kahn (1983) confirmed that children with pmld remain in the sensorimotor stage of development. The seventy six severely and profoundly retarded children in this study, had chronological ages ranging between 2.5 years and 9.8 years. Their range of functioning across each of the Uzgiris and Hunt levels illustrated this: object permanence three months to fourteen months; means-end five months to thirteen months; vocal imitation nought to nine months; gestural imitation nought to nine months; causality nought to seven months; spatial relationships one month to eleven months. The study illustrates that pmld children function at varying rates lower than their chronological age but within the sensorimotor period.

4.3 The population of children with pmld in school

Although assessment results have been used to identify and categorise children as being profoundly retarded, there is little concensus in schools about the criteria for organising children into groups designated as having pmld. Schools have tended to use a range of terms to describe their organisation of groups of children with pmld. These have included, amongst others, 'high dependency group', 'developmentally young', children with 'complex learning difficulties', 'profoundly retarded' and 'special care' that is requiring a safe, secure environment where more robust pupils have restricted access. When these terms are used in schools, it is assumed that there is a common understanding of the nature of their difficulties. However, the range of difficulties is not always clear; the criteria for some children having pmld in one school may not necessarily be the same as in other schools. Evans and Ware (1987) noted fifteen different criteria used by schools to place children in special care units. A high proportion of staff in those schools surveyed, indicated that children who were multiply handicapped were most likely to be placed in those special care classes. This seems to be a general classification. However, Evans and Ware (1987) in their survey of 800 children did establish some recurrent features: 71.5% were non-ambulant, 79.2% were non-communicating, 61% of the

children had both of these features and 13% had additional sensory impairments. Cerebral palsy accounted for 32.6% and 10.4% had regressive conditions.

The use of intelligence tests and developmental scales has assisted in the characterisation of children with pmld. The information that these assessments produce indicates that the opportunities for learning that are available to other children may not be so for children with pmld. Although this is a heterogeneous group, these children have a number of complex educational difficulties which need to be identified through a range of assessments, not only those which might identify their developmental status but those which might contribute to meeting their needs and the possible constraints which they may face in the interaction process. The teacher of children with pmld would need to be aware of these in order to create an artificial scaffold which takes into account the 'normal' but makes allowance for these children's impairments and their slow sensory processing. Sensory impairment has been identified as a feature of some children with pmld (Evans and Ware, 1987). This has been defined by Longhorn (1984) as an inability to respond to, manipulate and make sense of the environment. She suggests that children with pmld lack the ability to make sensory preferences. In addition, if there is impairment, motivation may be absent. There are many conditions which affect sensory perception, for example, Batten's disease and Hurler's Syndrome. These are degenerative conditions which inhibit some sensory experiences (Gilbert 1993). O'Connor and Hermelin (1986) suggest that the difficulties some children may have, may be due to sensory handicaps. They suggest that such impairments affect encoding processes and this produces a limited picture of the environment. It would seem that, given the extensive central nervous system dysfunction which children with pmld are likely to have, their sensitivity to sensory experiences will be affected.

4.4 Constraints on interaction with children with pmld.

Children with pmld have a range of constraints which limit their opportunities for

interaction, hence they have restricted opportunities for learning and development.These constraints would appear to have two perspectives. Firstly, those characteristics which are 'within' or internally controlled, in other words they are part of the child's physical, sensory and cognitive condition. A child's physical condition may inhibit his ability to interact with others because he cannot make the physical signals to show his intent. On occasions he may also make signals which are imperceptible to others because of physical limitations. Secondly, there are external constraints which impair the child's capacity to interact. These are environmental and occur as a result of social factors, such as the lack of responsivity in caregivers and the barriers that placement in organised settings such as schools may bring.

Children with pmld have a combination of physical, sensory and cognitive impairments. Additional impairments such as epilepsy are also a common feature (Evans and Ware, 1987). Many of these impairments restrict the child's opportunities for receiving and emitting communicative signals. Chusid (1970), in analysing the localisation of functions in the brain, notes that seizures occurring in the various parts of the brain have significant effects on the perceptions of the individuals experiencing them. Although such seizures may not always be outwardly evident,they will affect a child's ability to respond to interaction. Current medication has a controlling effect on the occurrence of seizures, but can also impair cognitive functioning. The child may be physically incapable of responding, because the medication sometimes impairs sensory perception. It has been shown from analysis of the way in which children with sensory disabilities process information, that they have a limited picture of themselves and the environment (O'Connor and Hermelin, 1986). Nind and Hewett (1994) identify passivity as a predominant feature of children with pmld and Ware (1996) notes slow responses as another characteristic . Aslin and Smith (1988) have noted that it is possible for children to have cerebral structures which do not function rapidly enough to enable them to process incoming information. This appears to be the case with children with learning difficulties who

have structural memory deficits. They are unsuccessful in their attempts to process certain types of information which require the use of short term memory (Ellis et al, 1985).

If children are to develop as social beings and to take an active part in interaction, they must focus on events in their environment. The majority of behaviours observed in children who have pmld are inwardly focused. There is a preoccupation with self stimulation, which for some children is an end in itself and for others a means of satisfying physical needs. If the child with pmld is to acquire a knowledge about the environment, and to interact with it, he needs to be motivated to become outwardly focused and, therefore, advance his cognitive development. Hence there is a need to direct children to acquiring knowledge about others and the environment in general. (Stillman and Battle 1984).

Schools, like other institutions, may not have the ideal conditions for encouraging children to interact. Beail (1985) analysed the quality of interaction occurring between nurses and individuals with pmld in a hospital setting and found that few opportunities for interaction were available and those that were taken up were of poor quality.

> "Schools can be alien, artificial learning environments which bear only a passing resemblance to learning situations in the world outside the classroom. This may be especially true for those children marginalised for reasons of social background, culture ethnicity or gender." (Wheldall and Glynn, 1988, p5)

Weinstein (1991) believed that the different activities which take place in the classroom determine how and when each person relates to others. The differing contexts apply their own social and interactive demands. Whilst Weinstein (1991) and Wheldall and Glynn (1988) were commenting on the mainstream classroom,

there are no doubt parallels which can be drawn by the teacher of children with pmld. For these children, the conditions in the classroom may reflect those previously identified by Schaffer and Liddell (1984). There are competing bids from children for the attention of the teacher, some of which will receive a response whilst others may be temporarily ignored. Gallagher (1984),in an attempt to understand how children with learning difficulties develop, analysed the the varying influences on children's language development. Teachers in special schools continually ask themselves questions about the children in their classes: how can their potential be developed? Why are school related activities difficult for them to learn? Why do they find empathising difficult? To address these questions Gallagher (1984) constructed a model identifying the relative strengths of variables influencing children's language development. He identified the child's family as having the greater influence and suggests that teachers should mirror the approaches used by family and significant adults. A wider understanding of the aetiology of differing interaction patterns between caregivers and infants with pmld, needs to be gained:

> "without knowledge of the dynamics of the interactions between retarded children and their mothers we cannot hope to understand fully the development of these young children, nor be able to work in concert with parents regarding their children's development."
>
> (Krause Eheart, 1982, p25)

It has been shown that children with neurological impairments often do not manifest behaviours showing attachment relationships with their caregivers (Stahlecker and Cohen, 1985). This may be due to the absence of 'person permanence' which is a prerequisite to attachment relationships. However, the terminology used to describe attachment with children with pmld may need some interpretation. Observations in Stahlecker and Cohen's (1985) study showed evidence of some form of relationship. The interactions observed did not show clear recognition of, nor a preference for the mother, but some of the children's behaviours brought out close responses from her. Mothers attributed meaning and responded according to that attribution, showing a

form of reciprocity. It has been pointed out, that mothers of children with handicapping conditions initiate fewer social interactions and exert more control over the play of their children, than mothers of children without handicapping conditions (Cunningham et al, 1981). Hanzlik and Stevenson's (1986) study supports this view. They found that mothers of both physically and mentally disabled children were more directive and the children showed lower levels of verbal behaviour than with dyads where children had no disabilities. The children illustrated fewer behaviours and were less responsive to their mothers. Fraser and Rao (1991) suggest that parents who are more directive spend less time in interaction. Parents of children with handicapping conditions may take a low level of arousal as helplessness:

> "..the state of arousal of the handicapped person
> seems to have a bearing on the learning of
> interactive skills as this may determine
> the contingencies of the maternal response."
> (Fraser and Rao, 1991, p 86)

It has been suggested that caregiver interaction with neonates who have illnesses has a limited quality. Studies of the quality of adult interaction with infants who were ill, found that more time was spent on caretaking activity than interaction (Greene et al, 1983). Other studies however contradict this view and have shown that there are few constraints on the interaction process between caregivers and children with pmld. Burford (1988) for example, notes that cycles and rhythm were present in interaction between adults and individuals with pmld. The interactions showed features such as touch, attention getting behaviour, maintenance, shared activities, reassurance and affective behaviours. Marfo (1990) in a similar study, emphasises the point that parents can be directive and yet still show responsiveness and sensitivity.

Although children with pmld have a number of clinical features which may place constraints on their interactional capacities and parents may make inappropriate

responses due to perceptions of their children, researchers have noted that interaction with children with pmld can be positive and assist them in their development. Teachers need to be aware of those elements caregivers use to facilitate their children's best responses, so that they can adopt them as part of the educational process in the classroom.

Some understanding has now been gained from past studies of infant/caregiver interaction. An awareness of the possible problems that may occur, particularly problems that children with pmld might have, has been acquired. The writer is now in a position to embark on a small scale longitudinal study in this area.

5. Methodological Considerations.

5.1 Introduction.

It can be seen from previous chapters that children with pmld have a number of constraints on their development. Their responses to events in the environment are sometimes imperceptible to the observer, or difficult to analyse. However, there are sufficient grounds, from research already noted, to suggest that intensive interaction encourages a degree of communicative competence and sociability in children with pmld. There is a need to broaden understanding of the process and to provide information to support this premise. Therefore, research into interaction phenomena in the teacher/child dyad needs to have data collection procedures which will determine with some precision the effects each participant has on the other. The most appropriate methodology to fulfil this need is an observational one. Hence it is intended in this study to use and analyse videotape records of adult/child interaction. This chapter will examine the research traditions which have been chosen for this study of adult/infant interaction. It will assess the possible advantages and disadvantages of these methods.

5.2 Methodological approaches.

In order to ascertain what occurs in interaction between the adult and child with pmld the most appropriate approach is one where direct observation of events is used. One can gain greater detail because direct access to the interactions is involved. It is intended in this study to use interaction analysis. This is a system for observing and analysing classroom interaction which includes measures of frequency of behaviours. Interaction analysis is one of the principle methods for establishing features of classroom behaviour and is a procedure which is appropriate for use in adult/child interaction. It has been successfully used by researchers working in classrooms and in teacher training (Galton and Simon, 1981). The data processing technique frequently used with observational methods involves the use of tally sheets and will be used in this study (Appendix 1). The behaviours to be recorded for each child

include: attentive/anticipatory events, imitation of the adult, vocalisation, posture change, eye contact and facial expression. For the adult the behaviours to be recorded are: touch, smiles/facial movement, vocalisation, play movement, en face positioning and imitation of the child. Essentially, the procedure will include logging of events during a given period. By counting the coded behaviours over a period of time one can learn about patterns of interaction (Simpson and Tuson, 1995). However, a cautionary note in using this method from Zelditch, (1982) is that meaning and explanation have to be elicited from participants.

This study will also be longitudinal in approach. Interactions will be observed over a period of months. Longitudinal designs have been noted as having some advantages. In Halil's (1985) view, although the omission of controls in educational research adds to the problem of determining intervention effects, the introduction of some form of time series analysis may be a method for overcoming the problem. Robust statistical methods can also be used within the longitudinal approach and are advantageous in that there are fewer problematic issues in terms of sampling of subjects (Porges 1979).

There are disadvantages in using interaction analysis. The approach assumes that the researcher is neutral, objective and detached. Furthermore, the data collection procedures used in this approach, if they are tallies or counts, become mechanistic and reduce events in the classroom to behavioural units. The observer does not necessarily take up the participants' meanings or intentions (Hitchcock and Hughes, 1989). However, using such approaches are necessary where children with pmld are concerned, given their reduced range of interactional behaviours. There is a need to identify the minutest possible detail in their responses and any corresponding or associated behaviour in the adult.

In this research the data collecting procedure will be primarily through videotape recording. This method will enable the sampling of behaviours and assist in the identification of of important features (Nolan and Short 1985). Collecting data as it

happens with a member of staff recording what is observed will not be appropriate given the constraints on staffing in the classroom. There is one teacher and two classroom assistants to work with a total of eight children. Using videotape is a procedure which holds the information for the researcher to analyse and enables him/her to review the data record during coding (Adams and Biddle, 1970). As an information gathering procedure it aids observers in gaining a deeper understanding of the setting that pupils are in (Hitchcock and Hughes, 1989) This method of data collecting also makes causal relationships more accessible than other methods (Altrichter et al, 1993). There are some drawbacks in using a videotape recorder as a method for collecting information. The equipment used in recording can be distracting to the subjects. The distractions can be minimised by using a static camera and using often in the classroom so that pupils can habituate to it. Moreover, the day to day working of the classroom, having to deal with emergencies such as epileptic seizures, toileting, attending to information requests from other professionals, can impinge on the organisation of the research activity. If, as Guba and Lincoln (1982) note that good research takes place in the natural setting then videotaping events has to accommodate interruptions and the time for data collection has to reflect this.

From the videotaped information logging events during a given time period will provide data. The procedure of time sampling has been found a useful method of producing representative data where multiple behaviours are to be observed (Bourque and Back, 1982). Porges (1979), specifically focussing on research in infancy which is relevant to this study, sees time series designs as being advantageous because they provide researchers with a technique to describe changes in behavioural patterns and to evaluate the effects of intervention. This corresponds to Fraser and Rao's (1991) review of appropriate research methodology where the children to be studied have profound and multiple learning difficulties. They cite aspects of time series analysis as an effective element in research methodology.

Hutchinson et al (1988) point to the time scales that teacher/researchers have to

work to. If there is insufficient opportunity for quality evaluation this can pose a threat to the validity of the results. Repp et al (1988) suggest that researchers' familiarity with the setting makes observation more accurate, because they do not have the distractions which unfamiliar settings may give them. They cite Kent and Foster (1977), who note that observer reliability is low in new settings but increases with familiarity with the setting. To fulfil this aim, account must be taken of children's availability for learning. Fraser and Rao (1991) cite the need for children's level of alertness to be such that they are capable of making responses. Brazelton (1978) has identified degrees of alertness in the assessment of neonates and notes that 'state' is an important variable which needs to be considered when looking at children's responses. He stresses that what should be elicited are the children's 'best' responses for the purposes of assessment. If comparison is to be drawn between neonates and some children with pmld this is an important feature when eliciting responses from children. Hence the time periods for observation need to be when the children are at their most alert.

5.3 Data Processing Procedures

Given that the range of behaviours manifest in the interaction process have an obvious complexity, the research style often utilised to establish the relationship between adult/child behaviours is a correlational approach. This approach seeks to establish relationships between two variables or two sets of data. The 'Dataking' computer processing package can interpret numerical data in the form of graphs of percentage frequencies which can be compared. The information from the tally sheets (Appendix 1) will be processed using 'Dataking' and be interpreted in graph form showing comparison of adult and child behaviours.

The statistical information will also be used to calculate the coefficient of rank correlation. Correlational approaches seek to determine the direction of the relationships and their magnitude. Spearman's coefficient of rank correlation is the correlational approach to be used in this study. This approach uses statistical values

ranging from -1.0 to +1.0 and expresses relationships in a quantitative form. those close to -1.0 and +1.0 indicate strong relationships. General guidelines to the numerical values produced using coefficient of correlation are: from +/- 0.20 to +/- 0.35 show slight relationship between variables; correlations at the range +/- 0.35 to +/- 0.65 are statistically slightly more significant; those within the range +/- 0.65 to +/- 0.85 are more significant; values over +/- 0.85 indicate close relationship between the variables correlated (Cohen and Manion, 1989). Correlational techniques are useful in educational settings because they can exemplify and clarify relationships enabling the teacher/researcher to make predictions about the behaviours in question. It is noted that where small n studies are carried out then only variables with a high correlation can have significance. Low coefficients have little predictive value (Cohen and Manion, 1989)

5.4 Ethical considerations

When using a videotaped record of observations, these being authentic records of the situation, one needs to be mindful of the ethical dimensions of the procedure. The record could be an invasion of the privacy of the individual or it may not be in the individual's interests to have such a record (Altrichter et al, 1993). This is not the case in this study where the ultimate aim is in the pupils' interests, that is to establish firmer bases for learning. If one were to use control groups then ethical issues would need to be be raised about methodology.

> "teachers are required ethically to give their prior professional responsibility to the effectiveness of learning." (Winter,1989, p23)

It would be unethical for a teacher to deprive some members of the group of a teaching situation. An alternative is to offer a control group suitable but alternative approaches, however, this will be too complicated for the purposes of this study.

Research activity involving children with profound and multiple learning difficulties gives rise to other dilemmas for teachers. In most, if not all research involving human

beings, it is considered ethically essential for the researcher to gain the participants' informed consent. This is obviously not possible with children with pmld hence parents need be approached to gain consent and kept informed of the results. In addition the research dilemma may be resolved if the researcher considers possible negative and positive effects on the participants before carrying out the research. (Reynolds, 1979). Where the main purpose is to improve professional practice and so enhance their children's learning environment and further their educational development (Grundy, 1982).

The justification for the methods to be adopted in this study have been established. The nature of the research question, that is to determine with some precision the factors in the interaction process which can influence the social learning of children with pmld, dictates the methods to be used. An observational approach is to be used. Videotaped interactions will be analysed by an observer using tally sheets.

6. Methodology.

6.1 Introduction

Children with pmld function at prelingual levels and the curriculum should assist in maintaining their current functioning and enhancing their development. It should also facilitate the learning of social routines and as a result elicit a greater quality of responsiveness from them. In order to establish and deliver appropriate curricular content, teachers of children with pmld need methods and approaches which stimulate children's development. The use of interaction for children with pmld provides the content and means required by teachers.

6.2 Aims

The purpose of this study is to observe and analyse interaction phenomena in the teacher/child dyad and so provide information about the range of responsive behaviours which can be elicited in children with pmld. Once this is established it will inform the teacher of appropriate interaction strategies useful with children with pmld and provide a means for attending to their social, personal and cognitive development.

Informed consent is not possible when carrying out research with these children because of their early level of development. Parents can however be approached and kept informed of the results. The writer, has attempted to fulfil the ethical requirements for action research in the classroom. Parents have been contacted, their permission gained and they will be fully informed throughout the study and given a copy of the results. The videotaped material would not be used outside the school without prior parental permission. The writer will endeavour to ensure that the research process will not detract from the education of the subjects or their fellow pupils. It is hoped that on the contrary, all pupils will benefit, both during the study period and afterwards.

6.3 Subjects

The subjects in this study are four children with pmld, taken from the writer's teaching group of eight children. They attend an all-age school for children with severe learning difficulties and their characterisation as having profound and multiple learning difficulties is consistent with that outlined by Evans and Ware (1987) and Hogg and Sebba (1986) and noted in previous chapters. Selection of the children includes those who do not have a combination of significant hearing and visual difficulties as this could affect the results and make comparisons difficult. Those in very poor health are excluded, as frequent absence from school during the study period is inevitable. There are no further restriction on children included in the study group. There is no control group, as it is impossible to find a matching group of children for comparison purposes and it is not appropriate for those ethical reasons noted in the previous chapter. An outline of the characteristics is provided.

AP is a 9 year old boy with cerebral palsy and a general developmental delay. He is non ambulant and has frequent grand mal seizures. He does not have a significant visual impairment. He attends to visual presentations in close proximity but apparently does not attend to visual presentations over distances of three metres. Auditory responses are evident. These include alerting and orienting to sound sources. AP's cognitive functioning is at sensorimotor levels and he has an estimated developmental age of 2 months (Uzgiris and Hunt) (Table 1).

MM is a 6 year old boy with a handicapping condition which is the result of an unspecified chromosomal abnormality. He is non ambulant and has periodic grand mal seizures. There is no visual nor auditory impairment evident. MM has an estimated developmental age (as derived from Uzgiris and Hunt Scales of Infant Psychological Development) of 4.28 months and he is thus functioning at a sensorimotor cognitive level (Table 2).

JS is a 5 year old boy with the handicapping condition Sturge-Weber anomaly. He is

Table 1
Summary from Uzgiris & Hunt Scales of Infant Psychological Development

Pupil: AP	Chronological age: 114months	
Scale	Highest Developmental Attainment	EDA(months)
Object Permanence	Fixates on objects held 8-10ins above the eyes	1
Means End	Activity level increases or decreases on seeing a visually presented object	2
Vocal Imitation	Shows positive response to familiar cooing sounds	2
Gestural Imitation	Attends to gestures performed by an adult	2
Causality	Vocalises and/or smiles in response to adult talking	2
Space	Searches for sound with eyes	2
Schemes	Mouths objects placed in the hand	3
Average EDA(estimated developmental age): 2months		

Table 2
Summary from Uzgiris & Hunt Scales of Infant Psychological Development

Pupil: MM	Chronological age: 83months	
Scale	Highest Developmental Attainment	EDA(months)
Object Permanence	Tracks objects through 180 arc	2
Means End	Visually directed reaching-shapes hand	5
Vocal Imitation	Shows positive response to familiar cooing sounds	2
Gestural Imitation	Performs consistent act in response to complex gestures composed of familiar schemes	7
Causality	Engages in hand watching	2
Space	Secures visually presented objects	5
Schemes	Drops or throws objects, no visual monitoring of action	7
Average EDA(estimated developmental age): 4.28months		

Table 3
Summary from Uzgiris & Hunt Scales of Infant Psychological Development

Pupil: JS	Chronological age: 71.5months	
Scale	Highest Developmental Attainment	EDA(months)
Object Permanence	Fixates on objects held 8-10ins above the eyes	1
Means End	Child engages in hand watching	2
Vocal Imitation	Shows positive response to familiar cooing sounds	2
Gestural Imitation	Attends to gestures performed by an adult	2
Causality	Repeats arm movements to keep toy activated	3
Space	Searches for sound with eyes	2
Schemes	Mouths objects placed in the hand	3
Average EDA(estimated developmental age): 2.14months		

Table 4
Summary from Uzgiris & Hunt Scales of Infant Psychological Development

Pupil: DW	Chronological age: 102months	
Scale	Highest Developmental Attainment	EDA(months)
Object Permanence	Fixates on objects held 8-10ins above the eyes	1
Means End	Activity level increases or decreases on seeing a visually presented object	2
Vocal Imitation	Responds to voice	1
Gestural Imitation	Performs consistent act in response to familiar gestures	6
Causality	Vocalises and/or smiles in response to adult talking	2
Space	Searches for sound with eyes	2
Schemes	-	0
Average EDA(estimated developmental age): 2months		

non ambulant and has occasional grand mal seizures. JS has a visual impairment,but attends to visual presentations in close proximity. There is no auditory impairment. JS has an estimated developmental age of 2 months (Uzgiris and Hunt) and is functioning at sensorimotor levels (Table 3).

DW is an 8year old boy with severe physical impairment which is the result of Reyes Syndrome. DW is non ambulant and has frequent petit mal episodes. There is no apparent visual or auditory impairment. DW has an estimated developmental age of 2 months(Uzgiris and Hunt) and is functioning at sensorimotor levels (Table 4).

6.4 Observational setting

The setting in which the children are to be observed is important. A laboratory setting, where the children would be taken out of their normal school environment and placed in a room with appropriate equipment and few distractions, has the advantage of standardisation of the environment. There is, however, the disadvantage that if children are not in their typical classroom environment and routine, this may have some effect on their behaviour. Repp et al (1988) suggest that researchers' familiarity with the setting makes observation more accurate, because they do not have the distractions which unfamiliar settings may give them. This research will be carried out by the writer, a teacher who is familiar with the subjects, in the familiar setting of the classroom. This should ensure that both researcher and subjects behave as naturally as is possible. The only unfamiliar object will be the static video camera, but the children will tend not to notice this, if it is at a reasonable distance from them. It is essential to ensure that a naturalistic setting is maintained when studying a topic such as interaction which requires spontaneity and a relaxed response.

Observation of children's responses during interaction sessions will indicate which of the adult's actions elicit the most favourable behaviours. During observations account must be taken of children's availability for learning. The teacher will use

those features identified in the background literature, noted earlier, as being present in infant/caregiver dyads: touch, facial movements (including smiles), vocalising in an infant register, use of play movements, adopting en face positions and use of imitation of infant behaviour. Children's behaviours to be noted are: attentive/ anticipatory behaviour, postural changes, vocalisation, eye contact and facial expressions.

6.5 Materials

Video tape recording as the principal source of data gathering. 'As it happens' observation and tabulation of data would be disruptive to the functioning of the school, as at least 3 members of staff would need to be involved in interaction, time logging and data collection. With the use of a video camera a maximum of two would be needed, one to operate the camera and the other to engage in the dyad. Another advantage in using video recording is that the coding system can be more complex. It would be impossible for the teacher to engage the child in meaningful interaction and fill in a complicated schedule. With the use of a video camera, the researcher is also able to observe and code his own behaviour. A second observer will be used on a later occasion when this method is adopted. This will provide a reliability check on the observations.

6.6 Procedure

Children will be videotaped in engagement with the writer for a duration of 2 minutes for 15 sessions over a period of 15 months. A schedule or tally sheet will be drawn up indicating those interaction features, noted earlier, occurring across the 2 minute sequence which will be separated into 5 second intervals (Appendix1). Repp et al (1988) notes that if intervals of 10 seconds or greater are used in a time sampling design, then the data may be unrepresentative. Repp et al (1988) reviewed observer accuracy and noted a number of concerns. Reactivity, where subjects are affected by the observer's presence, is one such feature as it cannot be assumed that behaviour occurs irrespective of the presence of the observer. However in this study reactivity is not an issue as 'participation' is necessary to the elicitation of responses

and the observer requires a reaction. A second concern is 'observer drift', or the gradual shift by the observer from the original response definition. This may present some problems with this investigation as the teacher/researcher may inadvertently broaden the definition of what constitutes a behaviour. However, the issue may be resolved with reliability tests through inter-observer agreement.

The video camera will be positioned so that it focusses on both child and teacher who will be configured for interaction. The teacher will indicate when the interaction period to be recorded begins and a member of staff, operating the camera and timing the interactions will indicate when the 2 minute duration has elapsed. The videotaped sequences will be monitored at the end of the data collection period by the writer and behaviours occurring in each of the 5 second intervals will be logged using the tally sheets (Appendix 1) A second observer will view random sequences from the videotaped interactions and log behaviours observed. Comparisons will be made with the observations logged by the teacher to determine observer reliability.

6.7 Presentation

It is noted that any coding system should reflect the purposes of the research (Bakeman and Gottman, 1988). Hence a study of interaction requires a coding system which identifies the features of interaction and the definition of what constitutes those features. This has already been identified in a previous section. This information needs to be given to secondary observers if accuracy is to be maintained. The coding system is to be a continuous recording of the frequency of behaviours occurring during interaction. When recording on the schedule/tally a complete record of all behaviours is to be made. This will ensure that behaviour frequencies are accurate. The principal disadvantage of this is that it is demanding for the observer who has to look and record at the same time.

The results will be presented in two ways. Firstly, in numerical form as percentage frequencies of individual behaviours of both child and adult occurring at

corresponding times. The second form of presentation will be line graphs showing the percentage frequencies of individual child behaviours matched against the range of adult behaviours. This format has been chosen so that illustrations of the rhythmic and synchronous nature of interactions may be better identified. As part of the analytical process coefficient of correlation will also be determined.

6.8 Results

The number of interaction sessions varied across the four children. Thus, children MM and DW were involved in 17 sessions, AP had 14 sessions and JS had 13 sessions. These differences were due to some of the sessions coming to an early close and children's absences.

A random sample of six interaction sequences, two taken from each of the group representing 9.83% of the total sequences, was selected by a second observer to establish reliability. Repp et al (1988) has noted that calculating inter-observer agreement has been the subject of considerable debate and that a range of formulae have been devised but no single procedure for acceptable agreement has been implemented. In this study the percentage difference between the behaviours observed by the researcher and those observed by the second observer was taken as the measure of reliability. Observer reliability was calculated to be 91.81% (MM), 89.95% (JS), 75.46% (AP) and 72.63% (DW). There was substantial correspondence in observations of two children and a significant correspondence in observations with two children.

Tables 5-8 show the percentage frequencies of behaviours occuring between the four children and the adult during the interaction sequences. Across the 2 minute periods there are fluctuations in the frequencyof the children's and adult's behaviours.

In Table 5 the adult's behaviours of touch, facial movement, vocalisation and en face positioning all have relatively high frequencies, with low frequencies in play

movement and imitation. There is a fluctuation in each of the behaviours of child MM with high and low frequencies evident.

Table 6 shows high frequencies in adult behaviours of touch, vocalisation and en face positioning, and fluctuations in the frequency of facial movement with no evidence of imitation. The child's (AP) behaviours show high and low frequencies in attentiveness, moderate frequency in postural changes, negligible occurence of vocalisations and low frequencies in eye contact and facial expression.

Table 7 illustrates consistently high frequencies in adult touch, and en face positioning, with some fluctuation in frequency of vocalisation which is generally high. Moderate frequency with fluctuations is seen in facial movement. Play movements and adult imitation are low in frequency. The child's (JS) behaviours show high frequency in posture change, moderate to low frequency in eye contact, facial expression and vocalisation and fluctuations between high and low frequency in attentive behaviour.

Table 8 shows adult touch and en face positioning to be high frequency with some fluctuation in frequency in facial movement and vocalisation. Play movements are low in frequency with negligible occurrence of imitation behaviours. The frequency in attentiveness and facial expression in the child (DW) is high with moderate frequency in eye contact. The frequency of posture changes is low but fluctuates. Vocalisations occurred with low frequency but show peaks in frequency.

Tables 9-12 show adult/child behaviours with their coefficients of rank correlation. Those of significance are indicated in bold type. Table 9 indicates the significant correlations calculated for adult facial movement and child vocalisation, adult play movements and child vocalisation and adult imitation and child vocalisation. Table 10 shows significant correlations in adult facial movements and child facial expression, adult imitation and child attentiveness, adult imitation and child

vocalisation and adult imitation and child facial expression. In Table 11 only adult play movement and child vocalisation show any correlation. Table 12 indicates significant correlation between adult touch and child attentiveness, adult touch and eye contact, adult touch and facial expression, adult play movements and child attentiveness, adult play movements and vocalisation, adult en face behaviour and vocalisation and adult imitation and eye contact.

Appendices 2-30 provide alternative representation to the tabulation set out in Tables 5-8 and although this may be viewed as unnecessary (Goulding 1984), the comparison of behaviour frequencies can be more clearly viewed. Interaction is a reciprocal process and this may not be clearly represented in numerical tabulations as in Tables 5-8. This study, in seeking to provide information about individual behaviours in intensive interaction, also needs to illustrate that there are rhythmic, synchronous and reciprocal elements present. Appendices 2-30 seeks to make these elements of interaction evident.

Table 5

Child: MM Percentage Frequency of Interaction Behaviours

Time	Attentive	Vocal	Posture Change	Eye Contact	Facial Exp.
5	29.41	35.29	41.17	41.17	29.41
10	29.41	23.52	47.05	41.17	29.41
15	17.64	35.29	76.47	35.29	41.17
20	23.52	41.17	52.94	47.05	41.17
25	41.17	47.05	64.70	52.94	35.29
30	35.29	41.17	58.82	52.94	11.76
35	41.17	41.17	52.94	58.92	35.29
40	29.41	47.05	41.17	52.94	47.05
45	29.41	52.94	47.05	47.05	29.41
50	29.41	41.17	47.05	35.29	23.52
55	41.17	47.05	64.70	47.05	35.29
60	35.29	41.17	70.58	47.05	52.94
65	31.25	31.25	62.50	43.75	31.25
70	50.00	50.00	37.50	50.00	37.50
75	43.75	43.75	75.00	62.50	31.25
80	43.75	62.50	43.75	56.25	25.00
85	40.00	53.33	53.33	60.00	40.00
90	53.33	60.00	46.66	73.33	20.00
95	71.42	42.85	35.71	78.57	50.00
100	42.85	42.85	42.85	64.28	57.14
105	53.84	46.15	46.15	76.92	46.15
110	69.23	69.23	61.53	76.92	53.84
115	72.72	36.36	54.54	45.45	36.36
120	37.50	62.50	25.00	37.50	25.00

Adult Percentage Frequency of Interactional Behaviours

Time	Touch	Facial Move.	Vocal(IR)	Play Move.	En Face	Imitation
5	94.11	64.70	82.35	0	88.23	0
10	82.35	58.82	76.47	0	88.23	0
15	94.11	70.58	76.47	0	88.23	0
20	76.47	47.05	64.70	0	82.35	5.88
25	82.35	52.94	76.47	0	100	5.88
30	88.23	52.94	82.35	5.88	94.11	5.88
35	82.35	70.58	76.47	5.88	94.11	5.88
40	70.58	70.58	82.35	5.88	94.11	11.76
45	88.23	58.82	82.35	5.88	94.11	5.88
50	82.35	58.82	82.35	11.76	94.11	0
55	82.35	41.17	88.23	5.88	94.11	0
60	82.35	58.82	82.35	0	100	0
65	81.25	50.00	68.75	18.75	87.50	6.25
70	87.50	56.25	75.00	18.75	100	0
75	81.25	43.75	81.25	18.75	93.75	0
80	75.00	50.00	81.25	12.50	81.25	0
85	80.00	40.00	80.00	13.33	73.33	0
90	73.33	60.00	80.00	13.33	100	0
95	78.57	57.14	85.71	14.28	100	7.14
100	57.14	50.00	78.57	0	85.71	7.14
105	65.53	69.23	84.61	15.38	100	0
110	53.84	69.23	76.92	15.38	100	7.69
115	63.63	63.63	81.81	9.09	81.81	9.09
120	87.50	87.50	87.50	0	100	0

Table 6

Child: AP Percentage Frequency of Interaction Behaviours

Time	Attentive	Vocal	Posture Change	Eye Contact	Facial Exp.
5	64.28	0	28.57	28.57	35.71
10	57.14	0	28.57	28.57	0
15	57.14	0	50.00	21.42	7.14
20	64.28	0	50.00	14.28	21.42
25	42.85	0	42.85	0	14.28
30	35.71	0	35.71	14.28	35.71
35	50.00	7.14	28.57	21.42	35.71
40	50.00	0	35.71	7.14	21.42
45	46.15	0	46.15	15.38	15.38
50	61.53	0	38.46	7.69	15.38
55	61.53	0	30.76	23.07	7.69
60	53.84	0	23.07	15.38	15.38
65	53.84	0	23.07	7.69	7.64
70	53.84	0	46.15	23.07	30.76
75	61.53	0	38.46	7.69	30.76
80	30.76	0	23.07	15.38	30.76
85	46.15	7.69	30.76	15.38	23.07
90	46.15	0	15.38	23.07	23.07
95	38.46	0	30.76	7.69	7.69
100	50.00	0	33.33	25.00	8.33
105	50.00	0	33.33	16.66	16.66
110	33.33	0	33.33	16.66	0
115	66.66	0	33.33	22.22	11.11
120	85.71	0	28.57	14.28	57.14

Adult Percentage of Interaction Behaviours

Time	Touch	Facial Move.	Vocal(IR)	Play Move.	En Face	Imitation
5	85.71	71.42	78.57	0	100	0
10	57.14	57.14	92.85	0	100	0
15	78.57	50.00	85.71	0	100	0
20	78.57	35.71	92.85	0	85.71	0
25	64.28	28.57	92.85	0	85.71	0
30	78.57	28.57	71.42	0	92.85	0
35	64.28	14.28	100	0	85.71	0
40	78.57	35.71	92.85	7.14	100	0
45	76.92	53.84	100	7.69	92.30	0
50	76.92	38.46	84.61	7.69	92.30	0
55	84.61	53.84	84.61	0	100	0
60	76.92	53.84	84.61	0	92.30	0
65	76.92	46.15	84.61	7.69	76.92	0
70	76.92	38.46	76.92	7.69	84.61	0
75	69.23	30.76	76.92	0	100	0
80	84.61	23.07	69.23	0	100	0
85	84.61	15.38	38.46	0	92.30	0
90	61.53	38.46	84.61	0	92.30	0
95	69.23	23.07	92.20	0	92.30	0
100	100	50.00	91.66	0	100	0
105	75.00	25.00	91.66	8.33	100	0
110	75.00	16.66	83.33	8.33	82.33	0
115	44.44	11.11	100	22.22	100	0
120	71.42	42.85	100	28.57	85.71	0

Table 7

Child: JS Percentage Frequency of Interaction Behaviours

Time	Attentive	Vocal	Posture Change	Eye Contact	Facial Exp.
5	46.15	30.76	92.30	15.38	38.46
10	53.84	30.76	84.61	23.07	30.76
15	53.84	23.07	92.30	38.46	30.76
20	69.23	15.38	69.23	46.15	53.84
25	53.84	23.07	100	30.76	46.15
30	61.53	15.38	92.30	15.38	76.92
35	84.61	30.76	92.30	23.07	69.23
40	61.53	30.76	61.53	30.76	15.38
45	76.92	23.07	76.92	23.07	69.23
50	53.84	0	100	30.76	46.15
55	61.53	0	69.23	30.76	30.76
60	61.53	7.69	100	30.76	38.46
65	45.45	0	72.72	9.09	18.18
70	45.45	9.09	63.63	18.18	18.18
75	45.45	0	63.63	27.27	18.18
80	54.54	9.09	72.72	27.27	36.36
85	63.63	18.18	81.81	36.36	0
90	18.18	9.09	72.72	0	36.36
95	27.27	0	54.54	27.27	18.18
100	50.00	10.00	90.00	20.00	30.00
105	30.00	10.00	80.00	10.00	20.00
110	50.00	10.00	80.00	30.00	30.00
115	75.00	12.50	87.50	12.50	37.50
120	60.00	0	80.00	0	20.00

Adult Percentage Frequency of Interaction Behaviours

Time	Touch	Facial Move.	Vocal(IR)	Play Move.	En Face	Imitation
5	69.23	61.53	84.61	0	92.30	0
10	61.53	61.53	84.61	0	100	0
15	92.30	23.07	100	0	100	0
20	100	53.84	92.30	7.69	100	0
25	92.30	46.15	84.61	7.69	100	0
30	92.30	76.92	84.61	0	100	0
35	92.30	76.92	100	0	100	15.38
40	100	46.15	84.61	0	100	15.38
45	100	53.84	92.30	0	84.61	0
50	84.61	69.23	76.92	0	100	7.69
55	92.30	53.84	84.61	7.69	92.30	0
60	84.61	38.46	76.92	15.38	84.61	0
65	90.90	45.45	81.81	9.09	90.90	0
70	90.90	36.36	63.63	9.09	100	0
75	100	27.27	72.72	18.18	100	0
80	90.90	45.45	72.72	18.18	100	0
85	72.72	54.54	72.72	18.18	90.90	0
90	72.72	54.54	90.90	0	90.90	0
95	100	27.27	72.72	0	90.90	0
100	100	20.00	70.00	0	100	0
105	100	50.00	90.00	0	90.00	0
110	100	30.00	70.00	0	90.00	0
115	100	12.50	75.00	0	100	0
120	100	0	100	0	100	0

Table 8

Child: DW Percentage Frequency of Interaction Behaviours

Time	Attentive	Vocal	Posture Change	Eye Contact	Facial Exp.
5	82.35	5.88	11.76	70.58	88.23
10	82.35	0	5.88	58.82	70.58
15	76.47	0	5.88	47.05	76.47
20	82.35	5.88	29.41	29.41	82.35
25	70.58	0	17.64	47.05	88.23
30	64.70	0	5.88	17.64	64.70
35	58.82	0	17.64	29.41	35.29
40	76.47	0	11.76	35.29	64.70
45	70.58	0	5.88	35.29	58.82
50	52.94	0	5.88	35.29	47.05
55	70.58	0	5.88	41.17	52.94
60	64.70	0	5.88	47.05	58.82
65	58.82	0	11.76	47.05	47.05
70	52.94	0	11.76	47.05	52.94
75	64.70	0	17.64	29.41	47.05
80	52.94	11.76	0	35.29	41.17
85	41.17	0	0	35.29	29.41
90	52.94	0	17.64	47.05	47.05
95	41.17	0	5.88	35.29	29.41
100	41.17	5.88	11.76	17.64	47.05
105	41.17	0	5.88	41.17	35.29
110	41.17	5.88	11.76	35.29	58.82
115	33.33	0	6.66	20.00	46.66
120	36.36	0	0	27.27	45.45

Adult Percentage Frequency of Interaction Behaviours

Time	Touch	Facial Move.	Vocal(IR)	Play Move.	En Face	Imitation
5	88.23	88.23	88.23	0	100	0
10	100	82.35	76.47	0	100	0
15	94.11	76.47	82.35	0	100	0
20	94.11	76.47	82.35	11.76	100	0
25	94.11	64.70	70.58	11.76	100	0
30	82.35	52.94	70.58	11.76	94.11	0
35	88.23	64.70	82.35	11.76	100	0
40	88.23	70.58	70.58	11.76	94.11	0
45	94.11	58.82	82.35	23.52	94.11	0
50	88.23	64.70	76.47	17.64	94.11	0
55	100	58.82	88.23	5.88	100	0
60	94.11	58.82	88.23	17.64	100	0
65	100	58.82	82.35	35.29	100	0
70	94.11	64.70	88.23	23.52	94.11	0
75	100	76.47	64.70	17.64	100	0
80	100	58.82	88.35	17.64	100	0
85	100	52.94	88.35	11.76	100	0
90	94.11	58.82	64.70	11.76	100	0
95	94.11	41.17	64.70	5.88	100	0
100	94.11	47.05	76.47	11.76	100	5.88
105	94.11	47.05	70.58	11.76	100	5.88
110	88.23	64.70	76.47	17.64	100	5.88
115	86.66	46.66	46.66	0	93.33	0
120	72.72	45.45	72.72	18.18	90.90	0

Table 9

Coefficient of Rank Correlation
Child: AP

	Touch	Facial Movement	Vocalisation	Play Movements	En Face	Imitation
Attentive	-0.06	0.39	0.23	-0.01	0.14	-0.09
Vocalisation	-0.20	**-0.60**	0.04	**0.64**	0.03	**0.85**
Posture Change	0.02	-0.18	0.13	0.03	-0.08	-0.21
Eye Contact	0.06	0.28	-0.10	-0.15	0.29	0.25
Facial Expression	0.14	-0.20	-0.16	-0.04	-0.02	0.01

Table 10

Coefficient of Rank Correlation
Child: DW

	Touch	Facial Movement	Vocalisation	Play Movements	En Face	Imitation
Attentive	-0.02	**0.72**	0.15	-0.37	-0.25	**-0.85**
Vocalisation	0.10	-0.23	0.10	0.24	0.40	**0.64**
Posture Change	-0.08	0.32	-0.31	0.04	0.27	0.04
Eye Contact	0.33	0.40	0.28	-0.08	0.25	-0.23
Facial Expression	-0.31	**0.60**	-0.01	-0.33	-0.32	**-0.66**

Table 11

Coefficient of Rank Correlation
Child :JS

	Touch	Facial Movement	Vocalisation	Play Movements	En Face	Imitation
Attentive	0.10	0.21	0.33	0.03	0.12	0.06
Vocalisation	-0.12	0.34	0.35	**- 0.55**	-0.10	-0.20
Posture Change	-0.27	0.24	0.15	-0.30	0.10	-0.10
Eye Contact	-0.13	0.05	-0.05	0.19	-0.14	-0.18
Facial Expression	-0.11	0.46	0.40	-0.37	-0.03	-0.28

Table 12

Coefficient of Rank Correlation
Child: MM

	Touch	Facial Movement	Vocalisation	Play Movements	En Face	Imitation
Attentive	**-0.56**	-0.05	0.20	**0.67**	0.33	0.36
Vocalisation	-0.23	0.01	0.30	**0.64**	**0.45**	0.18
Posture Change	0.14	-0.27	-0.22	0.03	-0.18	-0.12
Eye Contact	**-0.63**	-0.14	0.08	-0.15	0.24	**0.44**
Facial Expression	**-0.43**	0.06	-0.07	-0.04	0.09	0.36

7.Discussion

7.1 Relationships derived from coefficient of rank correlation.

The coefficient of correlation between percentage frequencies of adult behaviour and child behaviour shows the significance of the relationships. The probability levels for the correlations are given and are set out below.

i)Table 9 (Child AP) shows significant relationships can be seen between child vocalisation and adult facial movement (-0.60; $p< 0.05$), child vocalisation and adult play movements (0.64; $p< 0.01$).

ii) The greatest significance in relationship can be seen between child vocalisation and adult imitation (0.85; $p< 0.01$).

iii)In Table 10 (Child DW) significant relationships can be seen between: child vocalisation and adult imitation (0.64; $p< 0.01$) and child facial expression and adult facial movement (0.60; $p< 0.01$).

iv) Significance can be seen between child attentive behaviour and adult facial movement (0.72; $p< 0.01$), child attentive behaviour and adult imitation (-0.85; $p<0.01$) and child facial expression and adult imitation (-0.66; $p< 0.01$).

v)In Table 11 (Child JS) there is significance in the relationships between child vocalisation and adult play movements (-0.55; $p< 0.05$).

vi)Table 12 (Child MM) shows that significance can be seen between: child attentive behaviour and adult touch (-0.56; $p< 0.05$), child vocalisation and adult play movements (0.64; $p< 0.01$), child vocalisation and adult en face positioning (0.45; $p< 0.05$), child eye contact and adult touch (-0.63; $p< 0.01$), child eye contact and adult

imitation (0.44; $p < 0.05$), child facial expression and adult touch (-0.43; $p < 0.05$).

vii) Strong significance can be drawn between child attentiveness and adult play movements (0.67; $p < 0.01$).

7.2 Relationships interpreted from graphs.

Appendices 2-30 provide a graphic view of corresponding behaviours between the adult and child during interactions. There are strong indications that most of the adult behaviours have some bearing on the children's responses. Equally the children's behaviours have significant bearing on the adult's responses. There is some variation in the strength of influence each has on the other. Children's facial expression, eye contact, posture changes and vocalisations influence many of the adult's behaviours. When the adult displays touch, facial movements/smiles, vocalisations in an infant register, play movements, en face behaviour and imitating the child these behaviours have an influence on a range of child responses. Detailed analyses of the percentage frequencies of adult behaviours and child behaviours interpreted in graph form are set out below.

i) Children's attentiveness and adult touch and facial movement (Appendix 2). This section included analysis of the child's attentiveness to a combination of both adult touch and facial movement. This seemed necessary in the light of Gusella et al (1988) and Stack and Muir's (1989) research noting the importance of the combination of touch and facial movements.

In the sequences with all the children there are indications to suggest that 'touch' used in interaction with children with pmld plays a significant part in attention getting and maintenance, however it is noted that child MM took longer to become attentive. There is evidence of rhythm and synchrony in the graphs showing percentage frequencies of behaviour.

ii) Children's attentiveness and adult vocalisations (Appendix 3).

Children's attentiveness is influenced by adult vocalisations. Some influence is seen

early in the sequences for children MM and DW, although adult vocalisation appeared erratic with DW. The synchronous nature of interactions is evident in the percentage frequencies of children JS and AP's attentiveness and adult vocalisation.

iii) Children's attention and adult en face (Appendix 4).

The influence of adult en face behaviour on the attentiveness of children is significant. There is evidence of synchrony between adult en face behaviours and child MM's attentiveness, and rhythmic qualities appear between the adult en face behaviour and attentiveness in children DW and AP. In the exchanges with child JS it took time to have any effect on rhythm.

iv) Children's attentiveness and adult play movements (Appendix 5).

Attentiveness is significantly influenced by adult play movements for child MM. There is evidence of the positive effects of play movement on child JS. No conclusive indications can be drawn for child AP's attentiveness as there is infrequent adult play movement to compare. Child DW's attentiveness is aided by play movements and these aspects of the exchanges show a rhythmic quality.

v) Children's attention and adult imitation (Appendix 6).

Child AP's attentiveness is not influenced by imitative behaviours by the adult. The adult did not display any imitation behaviours with the child and only at low frequencies with children DW and JS. There is some evidence of child MM's attentiveness being influenced by imitation shown in the synchrony and rhythm in the interactions.

vi) Children's vocalisation and adult touch (Appendix 7).

The frequency of vocalisations in children MM and JS seems to have bearing on adult touch. Adult touch is led by children's vocalisations. There does not appear to be any significant overall increase in the vocalisations of DW and AP with adult touch, although two periods in the children's frequencies of vocalisation show a slight increase.

vii) Children's vocalisation and adult facial movements (Appendix 8).

For three of the children, MM, JS and DW adult facial movements influence their vocalisations. It is noted that the frequency of AP's vocalisations increase when the frequency of adult facial movement decreases.

viii) Children's vocalisations and adult vocalisations (Appendix 9).

The occurrence of vocalisation in MM and JS is influenced by adult vocalisations. There is evidence of rhythm. The frequency of DW's vocalisation shows some influence on adult vocalisation and child AP's vocalisation show an increase when the frequency of adult vocalisation is decreasing.

ix) Children's vocalisations and adult en face behaviour (Appendix 10).

Vocalisation in children JS, MM and AP seems to be influenced to varying degrees by the adult's en face behaviour. Rhythm seems to build up later between MM's vocalisations and adult vocalisations. En face behaviour from the adult does not have conclusive significance for child DW's vocalisations.

x) Children's vocalisations and adult play movements (Appendix 11).

There was some evidence of correspondence in the percentage frequencies of adult play movements and child vocalisation with child MM at the mid point in the sequences and towards the end of the interaction periods. However, there was no significant change in the vocalisations after adult play movements in the three remaining children. Rhythm is evident in the vocalisations of both child MM and the adult.

xi) Children's vocalisation and adult imitation (Appendix 12).

There is some evidence of influence by adult imitation on the frequency of vocalisation from MM, and slightly so for child JS. However, there is no significant matching of adult imitation to child DW's vocalisations. Adult imitation is not displayed in interaction with child AP.

xii) Children's posture change and adult touch (Appendix 13).

There was variation in the effectiveness of adult touch on children's posture changes. The frequency in posture change in child MM is influenced by adult touch. There is rhythm evident when these two aspects of interaction are compared. However, child JS's posture changes only gain rhythm and synchrony towards the end of the sequence. There is evidence of slight influence by adult touch on posture changes of child AP. Adult touch has no conclusive influence on posture change in child DW.

xiii) Children's posture change and adult facial movement (Appendix 14).

Appendix 22 shows evidence of the influence adult facial movement has on posture changes in child JS. There is also rhythm and synchrony to the behaviours. This appears later in the sequences of behaviour for child MM. There is some indication that adult facial movement is influenced by the posture changes in children DW and AP.

xiv) Children's posture changes and adult vocalisation (Appendix 15).

Adult vocalisation has some influence on the frequency of posture changes from children DW, AP and MM. Rhythm is evident in these aspects of the interactions. However, adult vocalisation is influenced by posture changes from child JS.

xv) Children's posture changes and adult en face (Appendix 16).

There was some evidence of the adult en face position affecting children's frequency of posture changes. This was minimal with child MM; where the adult behaviour decreased at two points, there was a corresponding decrease in the frequency of the child's behaviour. There was evidence of rhythm and synchronicity in the behaviours of children AP and JS, but there was only a minimal influence in the frequency of DW's posture changes. The frequency of adult en face behaviour was high throughout the sequences with DW.

xvi) Children's posture changes and adult play movements (Appendix 17).

The frequency of adult play movement is generally low but it does seem to have some influence on the posture change of children JS and AP; it seems to affect the frequency of posture change at two points. Posture changes in children DW and MM seem to lead the adult's play movements. There is some evidence of synchrony and rhythm in these aspects of interaction for child DW and the adult.

xvii)Children's posture changes and adult imitation (Appendix 18).

There is some evidence that adult imitation influences in child MM's posture change. Adult imitation shows no significant effect on posture changes in children JS and DW. Adult imitation is not evident in the interaction with AP.

xviii) Children's eye contact and adult touch (Appendix 19)

The occurrence of eye contact from three of the children AP, MM and JS seems to be strongly influenced by adult touch. In the interaction sequences with these children there is a rhythmic response of eye contact following adult touch.

xix) Children's eye contact and adult facial movement (Appendix 20).

Adult facial movement has influence on the frequency of eye contact particularly with child DW. A strong sense of rhythm was also noticeable in these aspects of interactions between the adult an DW. There is weaker influence by adult facial movements on eye contact in children MM and JS although rhythm and synchrony seem to occur in the later phases of interaction. Adult facial movements seem to be led by AP's eye contact, and rhythm is present in these aspects of interaction.

xx) Children's eye contact and adult vocalisation (Appendix 21).

The frequency of eye contact in DW and JS is influenced by adult vocalisation. Rhythm is evident in these aspects of interaction between DW and the adult. Adult vocalisation has no significant effect on eye contact in child AP. However, adult

vocalisation is influenced by eye contact from children AP and MM.

xxi) Children's eye contact and adult en face (Appendix 22).

Appendix 30 illustrates some evidence of the influence child MM's eye contact has on adult en face behaviours at early stages in the sequence. Rhythm and synchrony occur at later periods in the interaction sequences. There is some evidence of influence on eye contact with child JS and rhythm is also indicated. Adult en face behaviours are high in interactions with child DW, hence it is difficult to establish any influence on eye contact. Adult en face behaviours seem to have no significant effect on eye contact with child AP.

xxii) Children's eye contact and adult play movements (Appendix 23).

Adult play movements are influenced by eye contact from children MM, DW and AP. Eye contact in child JS shows some synchrony with adult play movement.

xxiii)Children's eye contact and adult imitation (Appendix 24).

The graph shows evidence of adult imitation influencing eye contact in child MM but is inconclusive with children JS and DW. Adult imitation of behaviours from child AP did not occur.

xxiv)Children's facial expression and adult touch (Appendix 25).

Adult touch seems to have some effect on the occurrence of facial expression in the early stages of the sequence with children DW, MM, and JS but shows a decrease in the later stage of the sequences.

xxv)Children's facial expression and adult facial movements (Appendix 26).

Children's facial expression influences and is influenced by adult facial movements with the children DW, AP and JS. Rhythm and synchrony are evident. Adult facial movement has influence on the frequency of facial expression in child MM.

xxvi)Children's facial expression and adult vocalisation (Appendix 27).

Adult vocalisation seems to have a significant influence on the frequency of facial expression in children MM, JS and DW. However, child AP's facial expressions seem to influence the occurrence of adult vocalisations. There is evidence of rhythm.

xxvii)Children's facial expressions and adult en face behaviour (Appendix 28).

En face behaviours from the adult influence facial expressions in child MM and rhythm is evident in these behaviours. There is a high frequency in adult en face behaviours during interaction with child JS but these do not show a significant influence on his facial expressions. Adult en face behaviour has some influence on the frequency of facial expression with child DW in the early stages. No significant influence is evident on the frequency of facial expressions in child AP.

xxviii)Children's facial expressions and adult play movements (Appendix 29).

Facial expression in children MM, AP and DW influence the frequency of play movement behaviour in the adult. Rhythm is evident. Adult play movement does not significantly influence facial expression in child JS.

xxix)Children's facial expressions and adult imitation (Appendix 30).

Adult imitation behaviours did not occur with child AP and occurred infrequently with DW. They show no significant influence on DW and JS. The occurrence of adult imitation is influenced by facial expression in child MM.

8. Conclusions Drawn from Examination of Adult/Child Interactions.

8.1 Introduction

This study set out to examine the responses children with pmld make in interaction with adults and to confirm that using intensive interaction, with a range of key behaviours, facilitates a better quality of responsiveness from the children. The study provides information about the individual behaviours of the participants in interaction. In examining the manifestation of behaviours of the adult and children with pmld, it has been possible to identify more clearly the strength of influence these behaviours have. This provides a firmer foundation for their use in intensive interaction with children with pmld and in the development of their sociability, communication and cognitive skills. The study also gives trainers of staff working with children with pmld, further information which might be used in highlighting the strategies available to staff when working with children with pmld.

8.2 Summary

It would seem from the responses children with pmld have made in interaction with the adult in this study, that the predisposition for interaction that is present in normally developing infants (Brazelton, 1978; Azmitia and Perlmutter, 1989; Trevarthen, 1979; Horowitz et al, 1978; Schaffer, 1977) is firmly established. It was evident that adult behaviours produced varying qualities of responses with children. A summary of these is set out below.

There are physical prerequisites noted as important for interaction, namely control in respiratory function and musculature (Trevarthen, 1979; Papousek and Papousek, 1984; Wulften Palthe and Hopkins, 1984). The children in the study have shown that these are sufficiently in evidence to enable them to make communicative sound.

Arousal has been said to be significant (Brazelton, 1978) and may have impinged on the adult's interactions with the children. The frequency of some behaviours was low for some children at the commencement of interaction. These behaviours only gained in frequency later in the interaction sequences. For example, child MM's vocalisations and adult en face behaviour became rhythmic towards the end of the interaction phase and child JS's posture changes acquired rhythm and synchrony only towards the end of the sequence (Appendix 13).

Although children with pmld have extensive physiological limitations, sufficient physical capacity is present to signal communicative intent. However, the adult may not always read those signals. This may have been the case with the adult's lack of imitative behaviour with child AP.

Children with pmld are active participants in interaction. Although their levels of cognitive functioning are delayed they are not passive recipients in the process. In the study the adult was led by the children in a number of aspects and the children's behaviour showed continuity in those phases. The range of adult behaviours influenced by the children illustrate, to some extent, that children with pmld share control in interaction and that discriminating capacities are present. Moreover, there are sufficient signals in children's responses to encourage the adult to continue with the interaction. For example: adult touch was led by children's vocalisations (Appendix 15). Posture changes in two of the children, DW and AP, influenced the frequency of the adult's facial movement (Appendix 14). Child JS influenced the adult's vocalisations with his posture changes (Appendix 15) and posture changes in DW and MM influenced the adult's play movements (Appendix 17). Child AP's eye contact in interaction influenced the adult's facial movements (Appendix 20) and adult vocalisation was ~~was~~ influenced by eye contact from AP and MM (Appendix 21). Eye contact from child MM influenced the early en face behaviour from the adult (Appendix 22) and adult play movements were influenced by eye contact from MM, DW and AP (Appendix 23). Facial expressions in children DW,

AP and JS influenced the adult's vocalisations (Appendix 27) and facial expressions in MM, AP and DW influenced the play movements in the adult (Appendix 29).

The importance of responsivity in caregivers has been stressed (Vandell and Wilson, 1987; Ware 1996) as responsive adults adjust their behaviour to the child, thus developing a synchronous interaction (Bernieri, 1988). Evidence of this has been shown in the study. Levels of adult responsivity have shown a synchronous pattern with child JS's eye contact and adult play movements (Appendix 23). This was also seen with child DW's posture changes and adult play movements (Appendix 17) and the posture changes made by AP and JS with adult en face behaviour (Appendix 16). Synchrony was also seen in child MM's attentiveness and adult imitation (Appendix 6) and en face behaviour (Appendix 4). Attentiveness in JS and AP and adult vocalisation (Appendix 3) showed similar synchrony. It has been noted that the level of synchrony which develops between the adult and child may increase with familiarity and hence children with pmld and adults may display greater synchrony in their interactions given sufficient time.

The significance which researchers give to adult touch on infant attentiveness was given some support through this study (Gusella et al, 1988; Stack and Muir, 1989; Massie, 1980). The use of touch in interaction with the children in the study showed that it was useful in gaining and maintaining attention (Table 12; Appendix 2). It also seemed to provide a motivation for the children to interact.

Adult facial movements have a significant effect on the child during interaction (Tronick et al, 1979). The children in the study showed this through responses such as vocalisations (Table 9; Appendix 8), eye contact (Appendix 20) and facial expressions (Table10; Appendix 27). These findings also substantiate the view that facial movements can evoke a range of engaged behaviours from children (Stack and Muir, 1989).

When adult use vocalisations in interaction with children, they often do so in what has been termed 'infant register' (Tronick, 1979). This was noted in the adult's approach to children with pmld. There was evidence in the study that this significantly influences all of the children (Appendix 3).

Play movements facilitate the coordination of sensory input for infants (Sroufe, 1982). It was evident that the children in the study were influenced by the adult's use of such behaviour. Children's attentiveness was gained (Table 12; Appendix 5), vocalisations were elicited (Tables 9, 11; Appendix 11) and posture changes were influenced (Appendix 17).

Children with pmld are motivated to interact when the adult uses en face behaviour. However, as Howe (1981) points out, habituation to the continual presentation of the adult's face takes place and the adult attempts to regain the child's attention. This was evident in the study. The adult used a range of behaviours to regain attention with JS (Appendices 16 and 22) and with child MM (Appendix 4). The rhythm in sequences with these children indicated this.

It has been suggested that parents imitate their children in an exaggerated way (Trevarthen, 1979) and do so almost subconsciously. It may be the case that the teacher of children with pmld needs to be more aware of his/her behaviour in this respect. He/she must make a conscious effort to imitate especially with children whose range of communicative signals is low. During the period of the study the frequency of use of imitation by the adult with child DW was low and did not occur at all with child AP. Imitation was used in interaction with MM and JS. Tables 9, 10 and 12 illustrate the relationship imitation has on children's eye contact, vocalisation, attentiveness and facial expressions

Researchers have noted that infants use smiles and facial expressions to acquire and hold adult attention (Sroufe, 1982; Tronick, 1979; Wulften Palthe and Hopkins,

1984). The children with pmld used smiles and facial expressions to gain and maintain positive adult attention. This was evident where adult vocalisation was influenced by the facial expressions of child AP (Appendix 27) and the facial expressions of MM, AP and DW influenced the adult's play movements (Appendix 29).

Eye contact with adults has been established as a precursor to jointly looking at, and learning about phenomena in the world (Papousek and Papousek, 1984). In this study the children with pmld displayed the capacity to establish eye contact. The adult showed that eye contact could be gained successfully by using touch (Table 12; Appendix 19), facial movements (Appendix 20), vocalisation (Appendix 21), en face behaviours (Appendix 22) and imitation (Table 12; Appendix 24).

Postural changes in children with pmld may not have the 'greeting' signal that has been described by Tronick et al (1979). There did appear to be an immediate increase in the frequency of this at the commencement of the sessions However, it does form part of the communicative repertoire of the children in this study and was utilised by the adult. This can be seen from interaction with DW and AP (Appendix 15).

Research by Trevarthen (1979) noted that adult attention and vocalisation can elicit vocalisation from the infant. When the adult used these features in the study (Appendix 9), along with facial movements (Table 9; Appendix 8) and en face behaviours (Table 12; Appendix 10) vocalisations were displayed by the children. However, the study gives little evidence of the children spontaneously vocalising to engage the adult in interaction. In the classroom it may be necessary for the teacher to structure situations where the children would be motivated to initiate interaction with vocalisations

The children in the study did not display any imitative behaviours during the

interaction sequences with the adult. The fact that at one month old infants imitate adult facial expressions (Maratos, 1973) and that this feature of imitation declines between the second and fifth month may have some bearing on this. The children in this study were assessed as having developmental ages of between two and four months (Tables 1-4) and this may explain why imitation of the adult's facial expressions was not in evidence. The children in the study would need to enhance their development for imitation to appear.

It was evident from the videotaped sequences, that there were varying degrees of significance between the children's behaviours and the adult's behaviours. Children with pmld exhibited many of the key features found in the interaction process. They were attentive, established eye contact and used posture changes, facial expressions, smiles and vocalisations to indicate their responses to interaction events. However, the element of imitation of adult behaviour was not evident in any of the children. One may conclude that the foundations for further social learning are evident. From the graphs plotted there was a strong sense of rhythm and synchrony in many of the interaction sequences.

After studying the videotaped sessions it became clear that many of the behaviours which researchers have identified in infant/caregiver interactions were not being displayed or encouraged sufficiently by the adult. There was a need to be aware of the wider range of 'behavioural units' being presented by each child, namely body position, head position, facial expression, direction of gaze, vocalisation, movements of the trunk arms, hands, legs and feet. The teacher/researcher should examine the meaning of such movements for each child and attempt to ascertain whether they indicate a negative or a positive response. It is not sufficient merely to take movement as a positive communicative response as the child needs to develop ways of indicating dislike or rejection at times. Implications of this and previous research suggest that there is a need for teachers to carry out more detailed observations and careful planning of learning opportunities for children with

pmld.

It is not always possible for the adult to maintain animated features during interaction and teachers may adopt a 'still face' (Stack and Muir, 1989). However, if touch or mild strokes become an integral part of the teacher's behaviour, one may counteract the aversive nature of a 'still face'. This is true of all adult responses in this situation. When teachers engage children with pmld in interaction the correct degree of 'intervention' needs to be gauged. Too low a level may produce little or no response and too high a level may produce aversive responses. A value judgement must be made in each case and teachers need to be aware of the sensory capacities of each child in order to make that judgement.

The importance of the appropriate use of language became more evident with each encounter with the children. There was a need to be more cognisant of the social procedures that adults use when speaking to the young and to use 'infant register' more appropriately. In the interaction routines, it became more evident that a slower tempo and greater modulation in frequency was needed when speaking.

It is not possible at this stage to determine whether the meaning that the adult ascribed to children's communicative signals does, in fact, contain the same meaning for the children. However, the 'intentionality' (Vedeler, 1987) that the adult gave to the children's communication acts produced turntaking evidenced through the rhythm appearing in many of the behaviours.

It is clearly evident that children with pmld are a heterogeneous group. Children with pmld are all individuals and need responses based on that individuality. Although the statistical analysis does not imply causality the suspected causal relationships of interaction behaviours would need to be confirmed by further study. The range of interaction behaviours to be examined could be broadened to include a breakdown of postural changes and specific vocalisations. This would need research methods

of a more robust analytical nature. Future research would need to look more closely at interaction in the classroom in terms of its organisation and the teacher's management of this.

8.3 Implications for practice

This study has already influenced the classroom practice of the writer. Although the intensive interaction sessions with children in the writer's school are unstructured, as suggested by Hewett and Nind (1994, 1998), there is a clear focus in the use of the behaviours examined in this study. It provides guidance on the most influential aspects of interaction behaviour which can be utilised. With clear behaviours confirmed as useful, the teacher can record their manifestation and strength of influence, and taken over a period of time this could provide indications of progress in children's sociability and communication.

With the decline in specialist courses focussing on pmld in initial teacher training, newly qualified teachers do not necessarily have the expertise to work effectively with children with pmld. Hence training is dependent on the school making provision either through distance learning or specific post qualification courses. Schools with budgets that have little flexibility for funding further out of school training need to have the material to provide that training within school. This study may provide a contribution to the development of that material.

Appendix 1

Session No.

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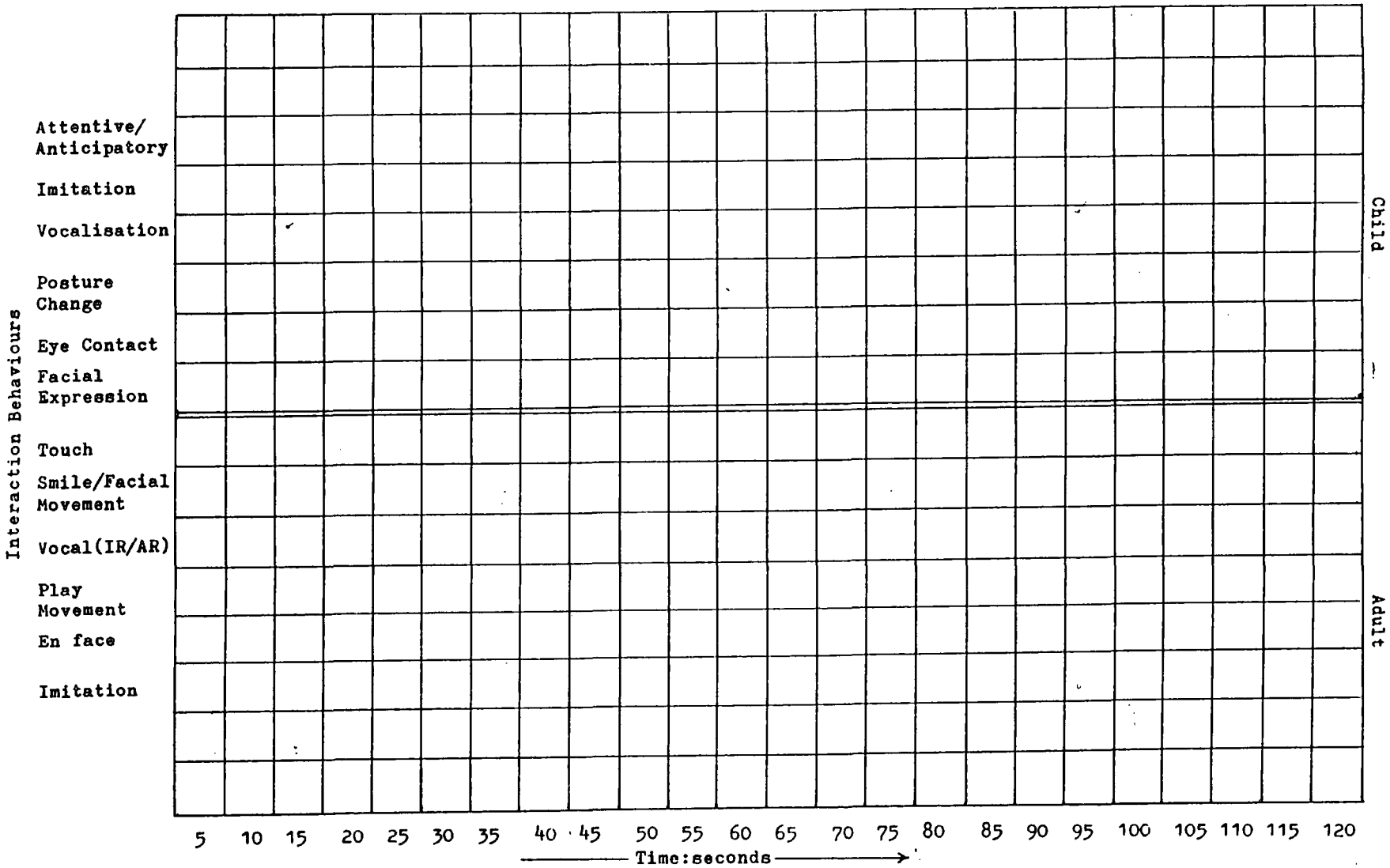
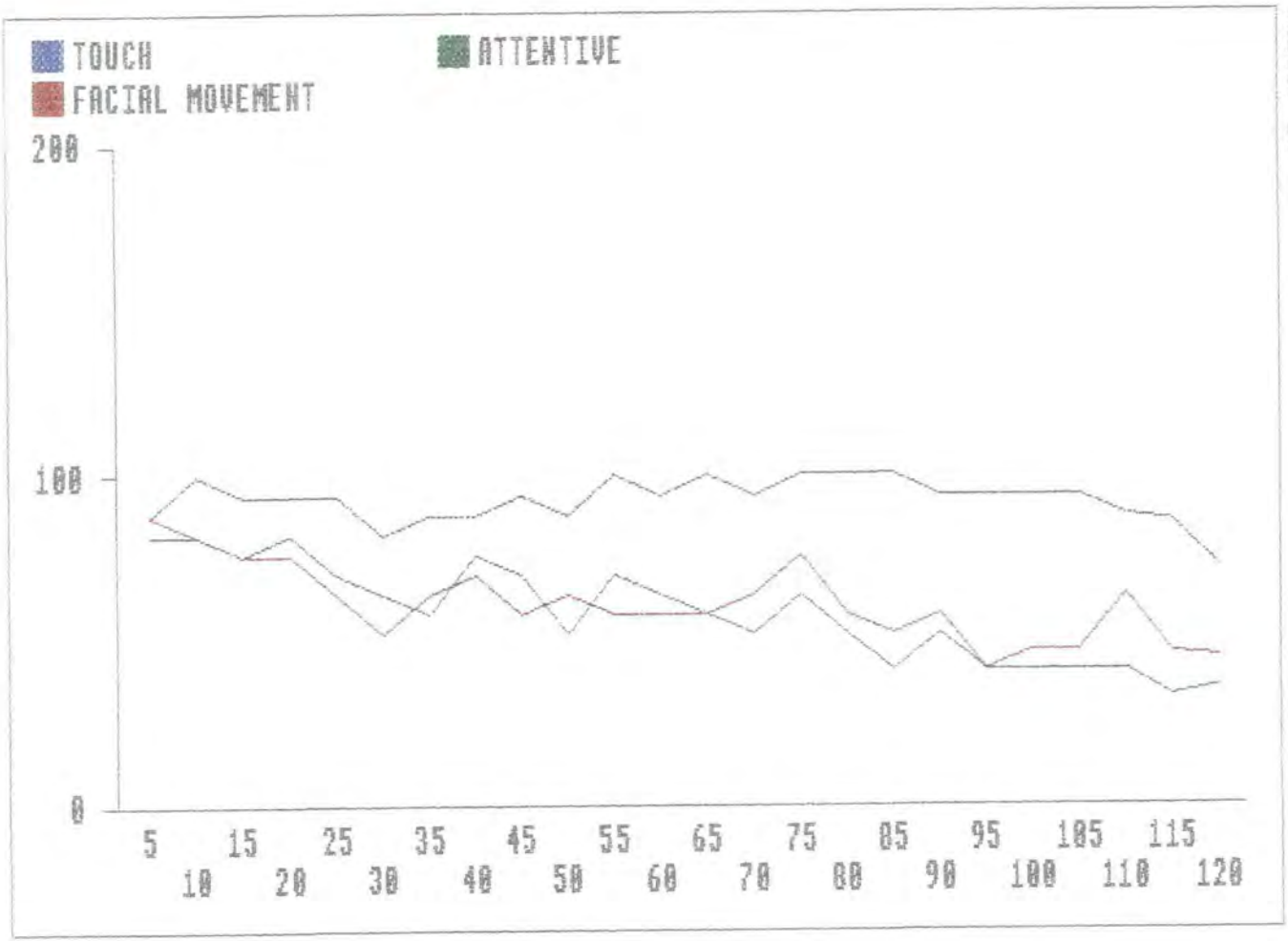


Appendix 2

Children's attentiveness and adult touch and facial movement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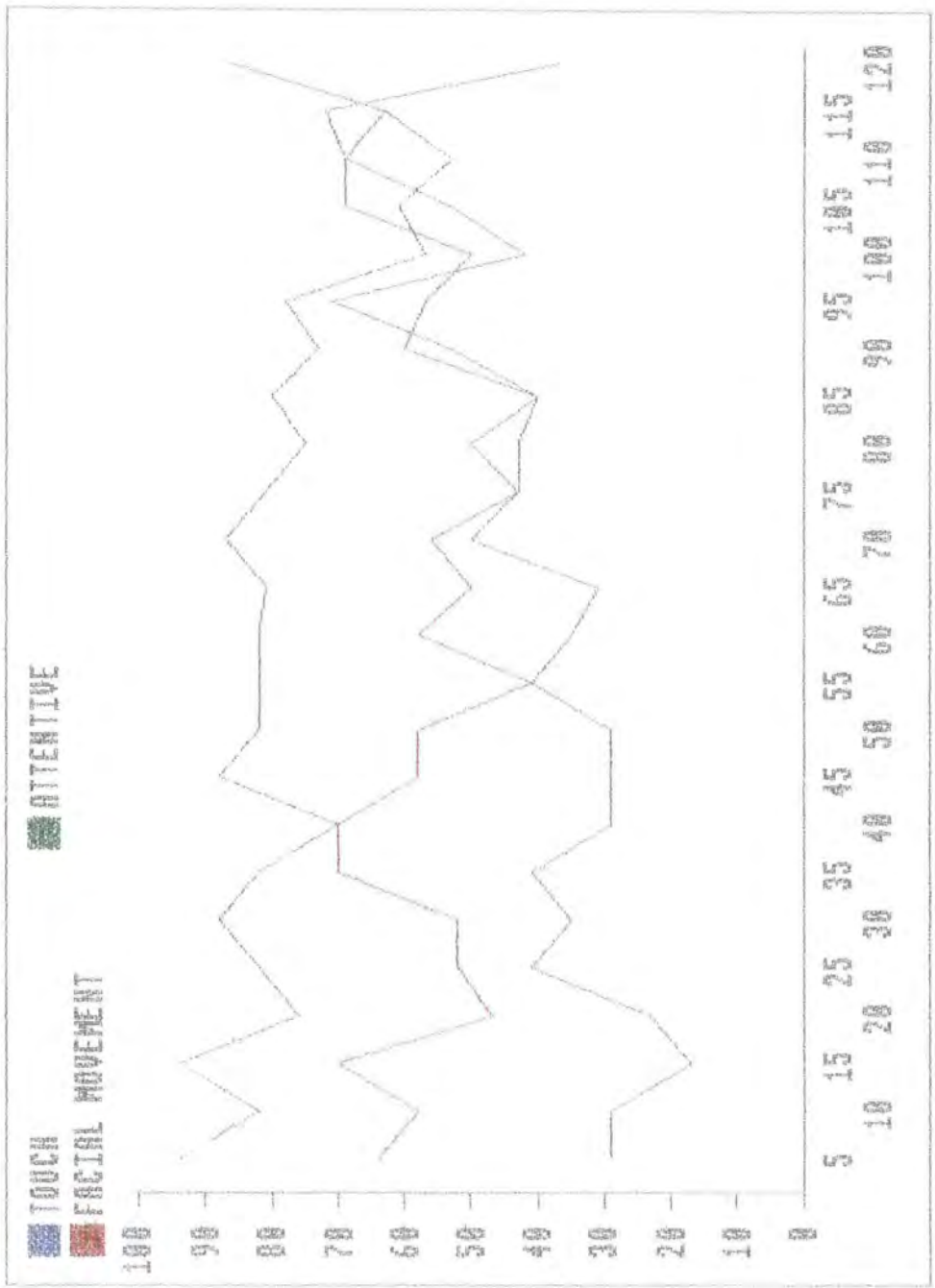
115
120

Child: DW

Child: MM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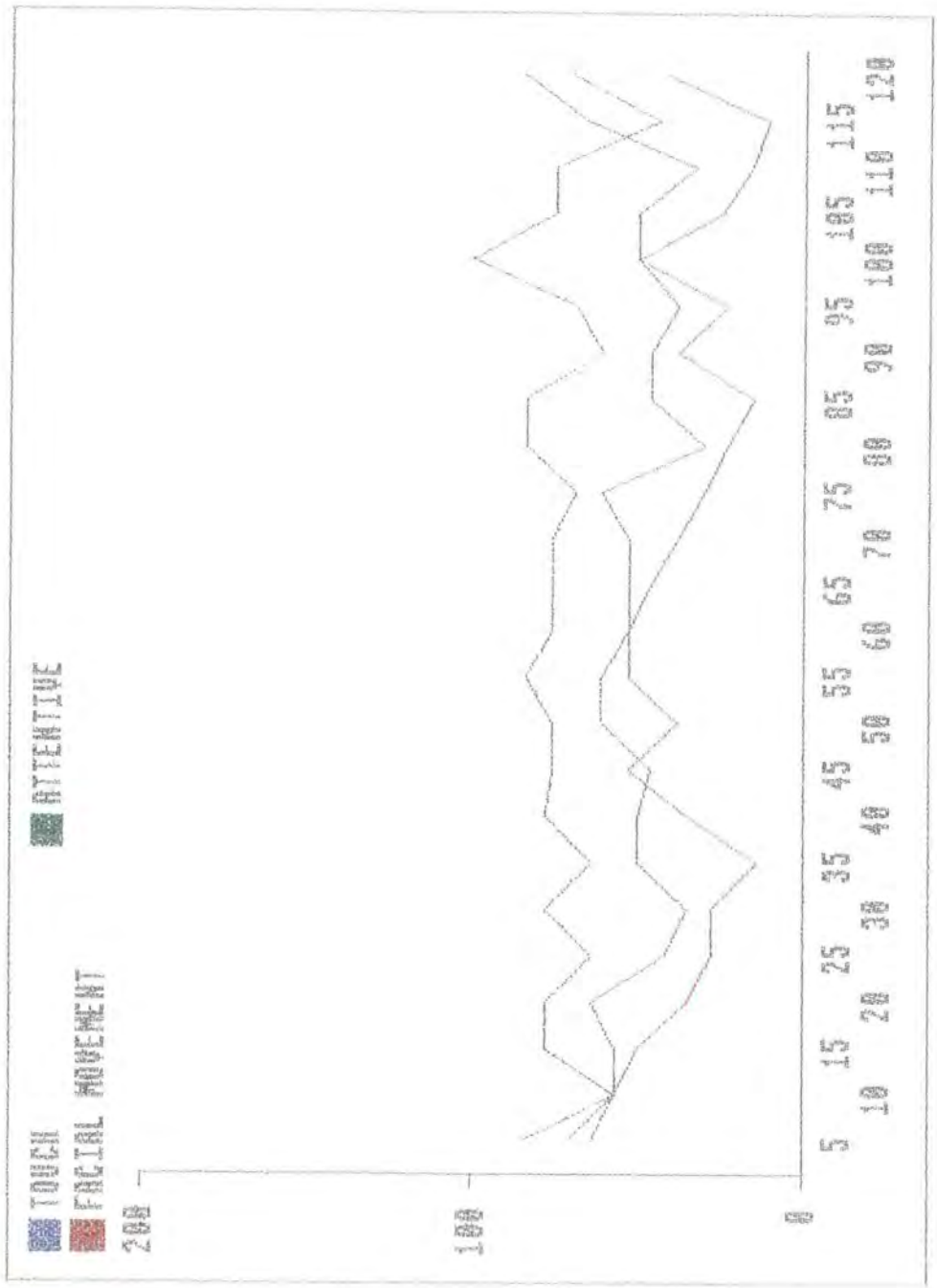
Child: AP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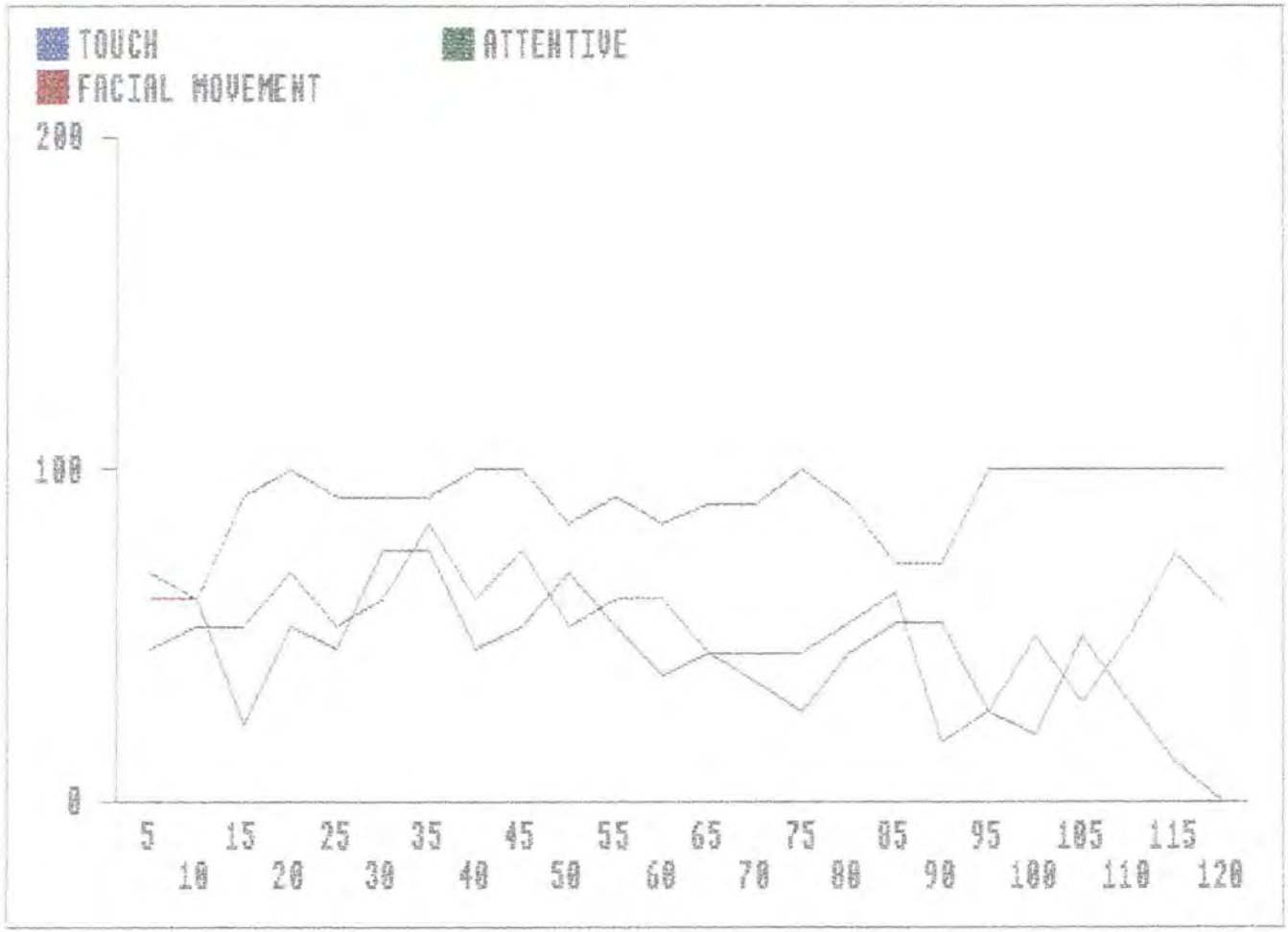
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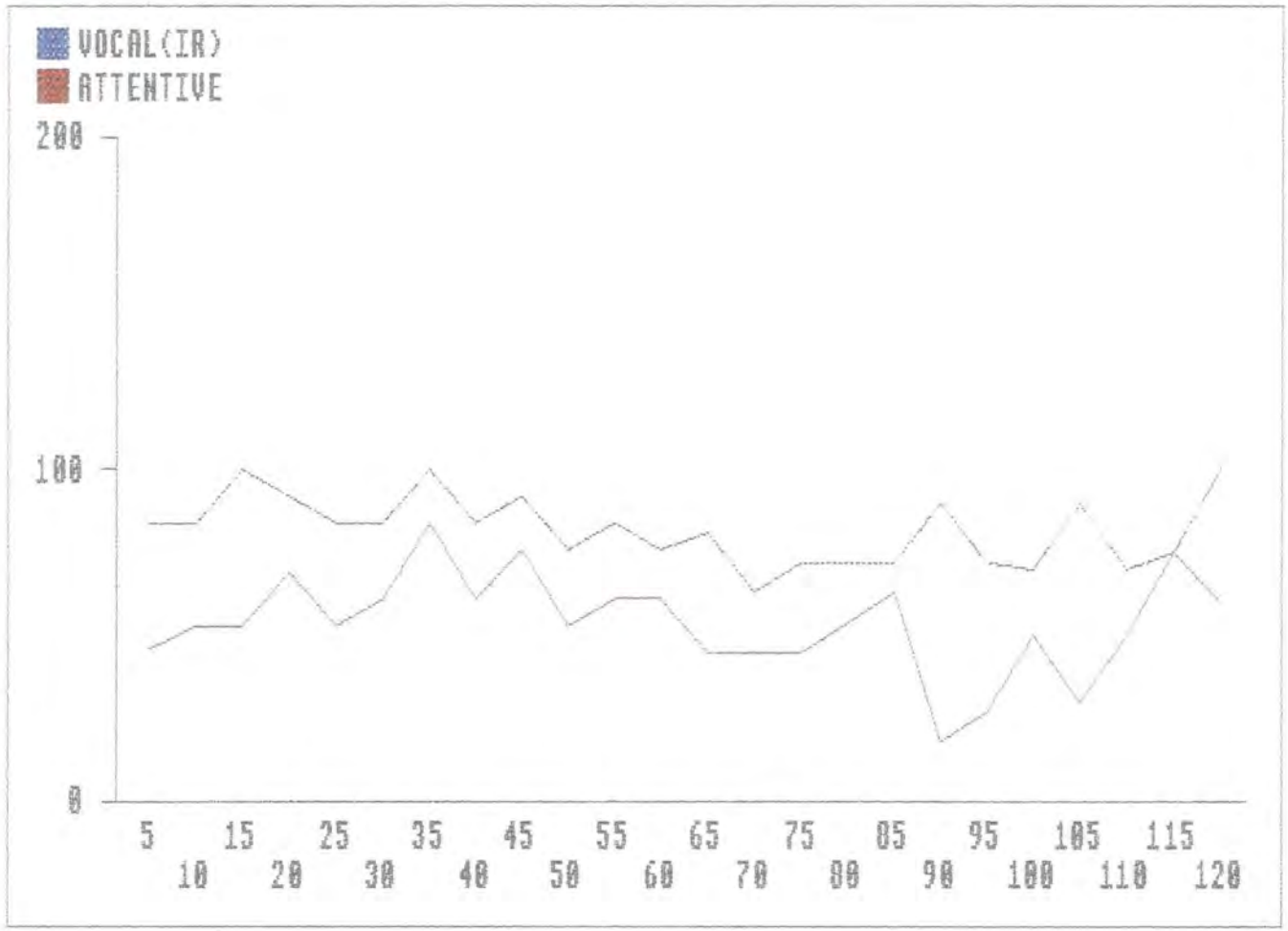
Child: JS

Appendix 3

Children's attentiveness and adult vocalisations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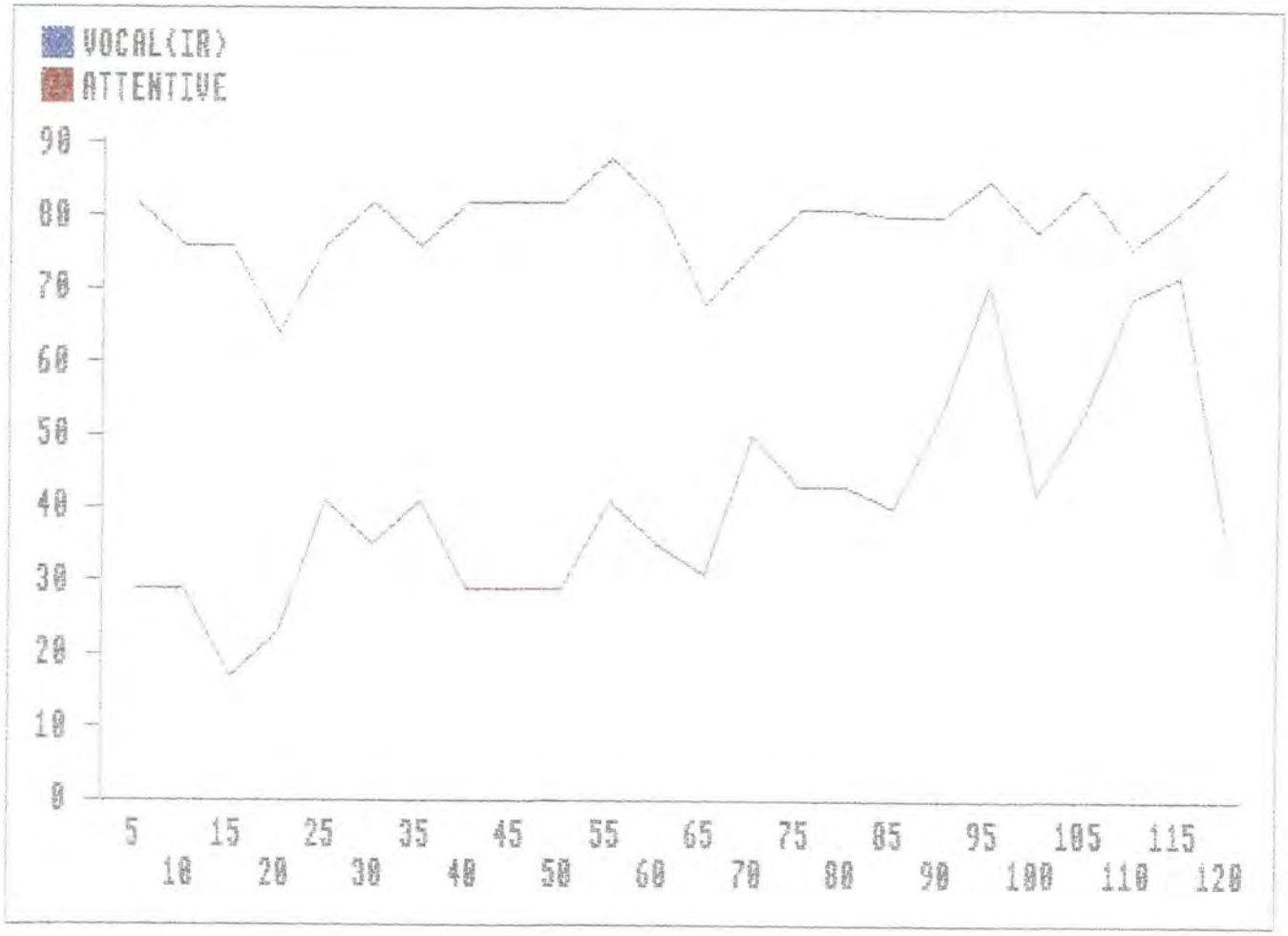
Child: JS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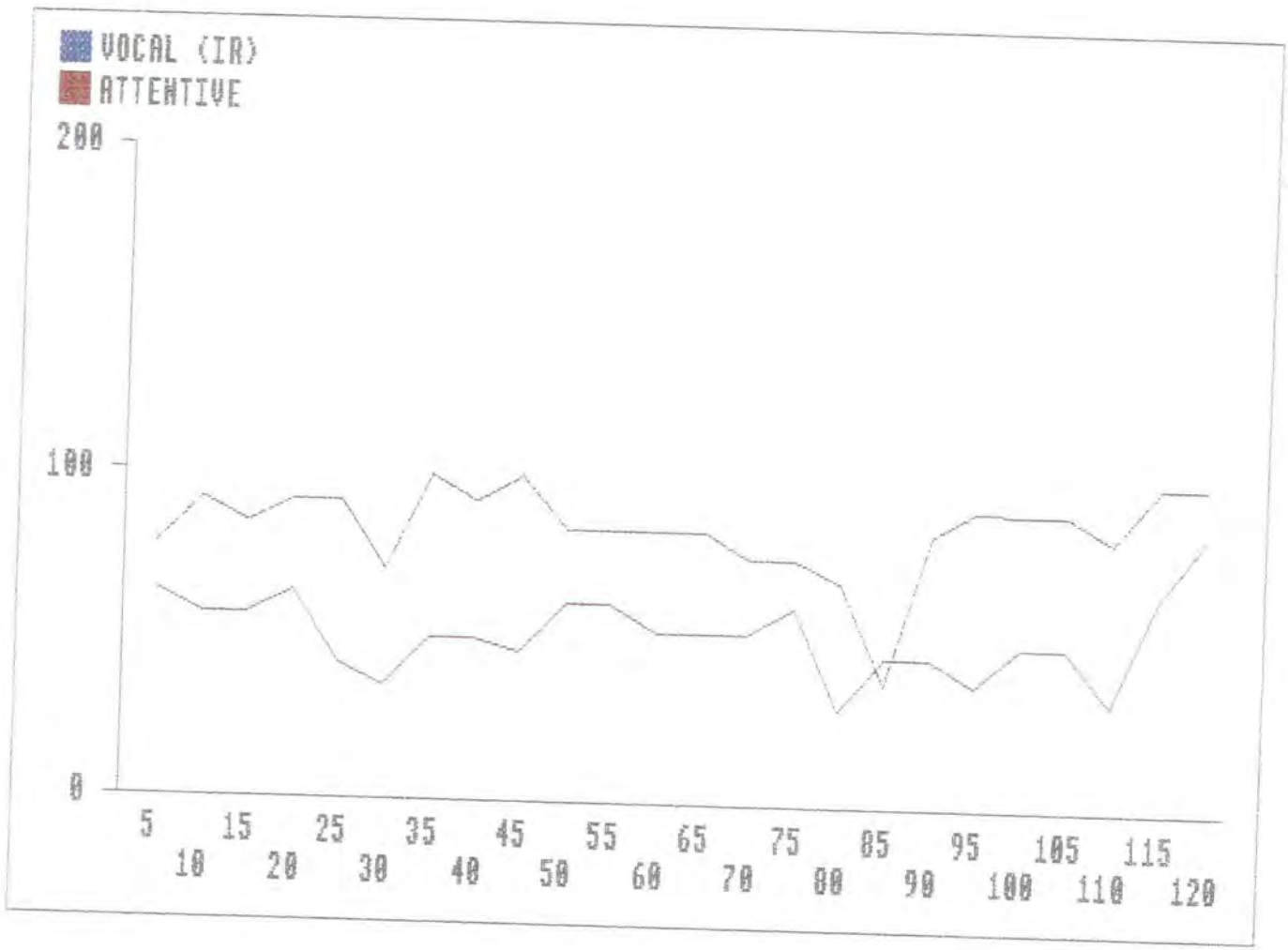
115
120

Child: MM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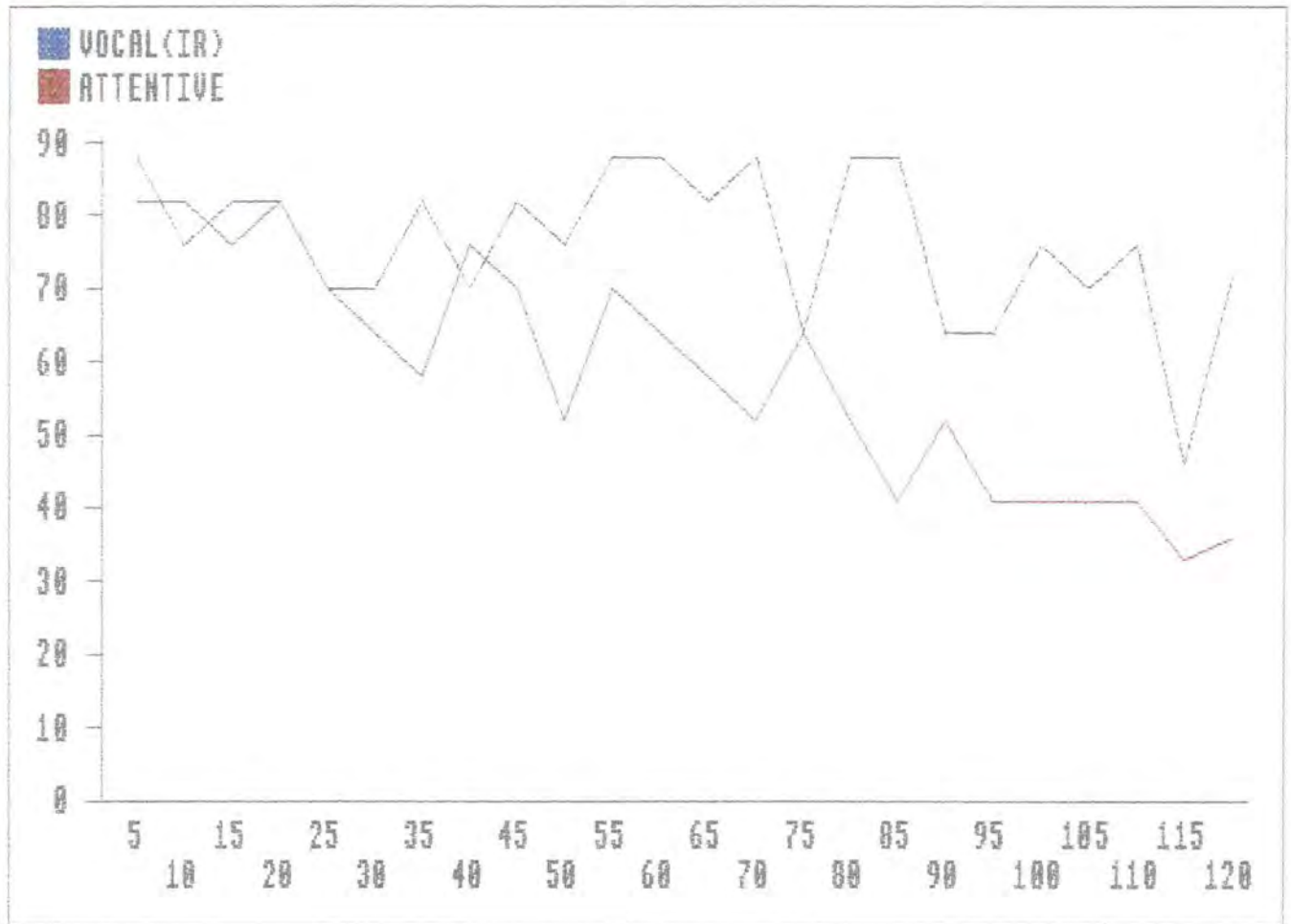
Child: AP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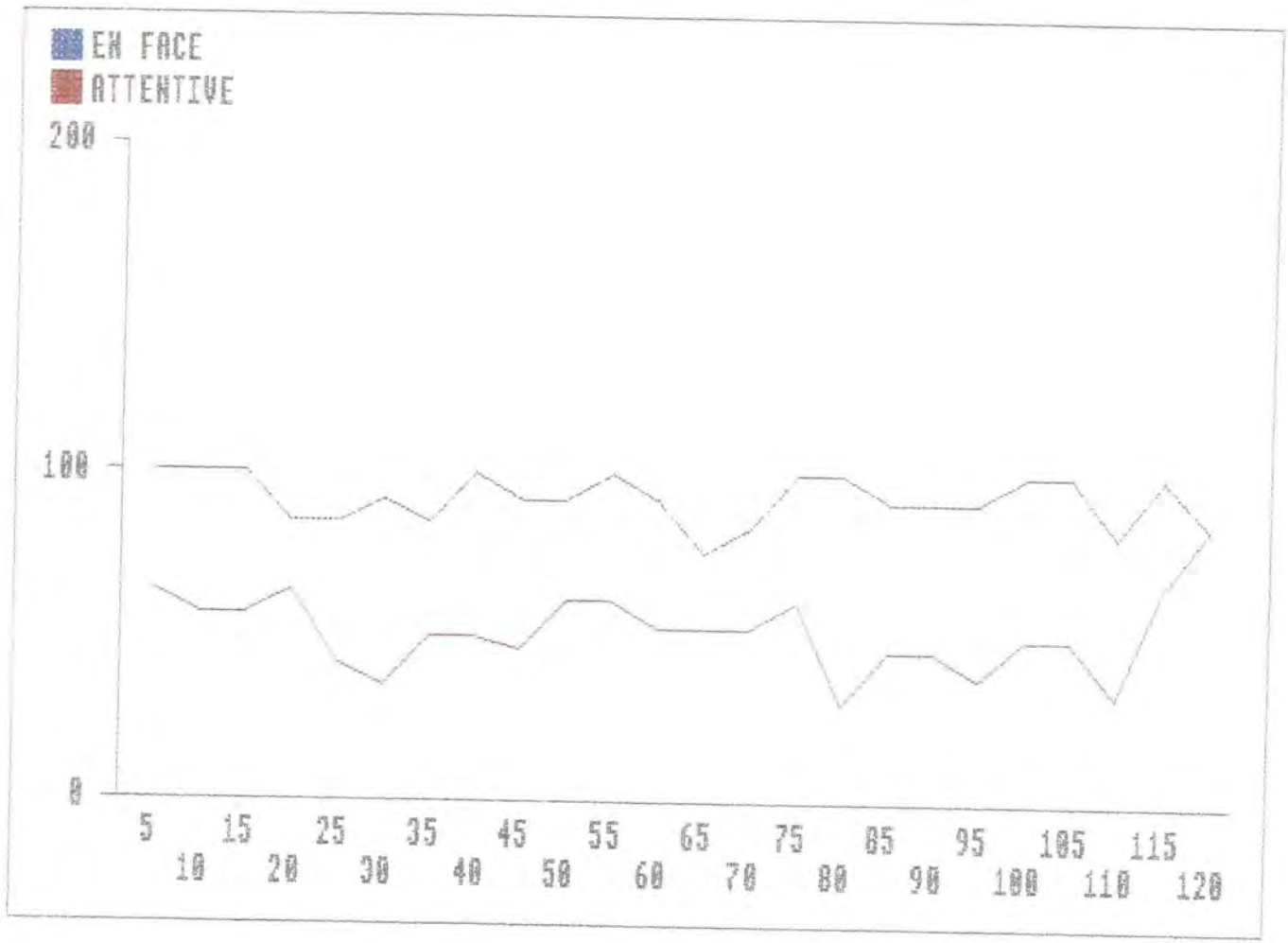
Child: DW

Appendix 4

Children's attentiveness and adult en face behaviour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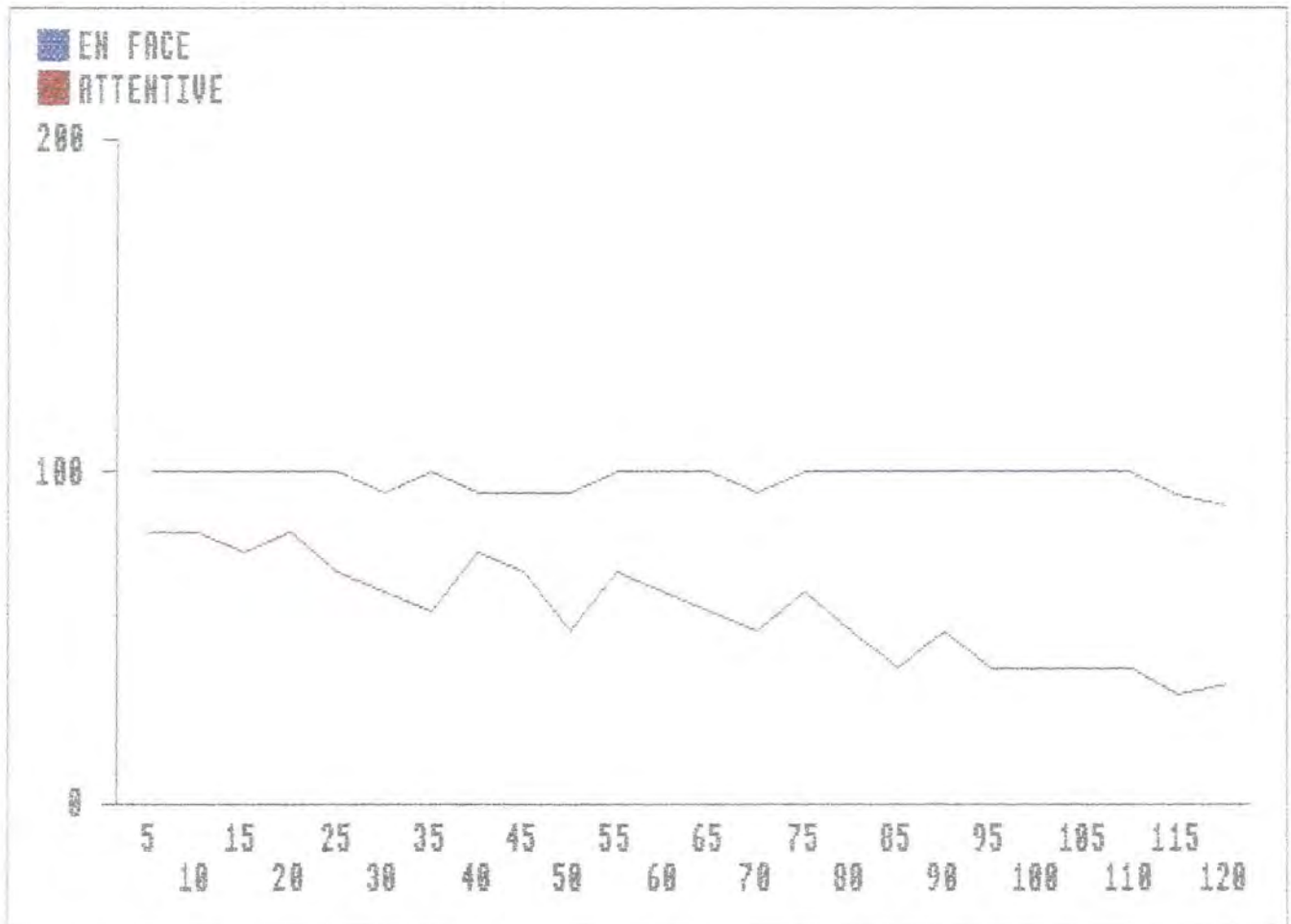
Child: AP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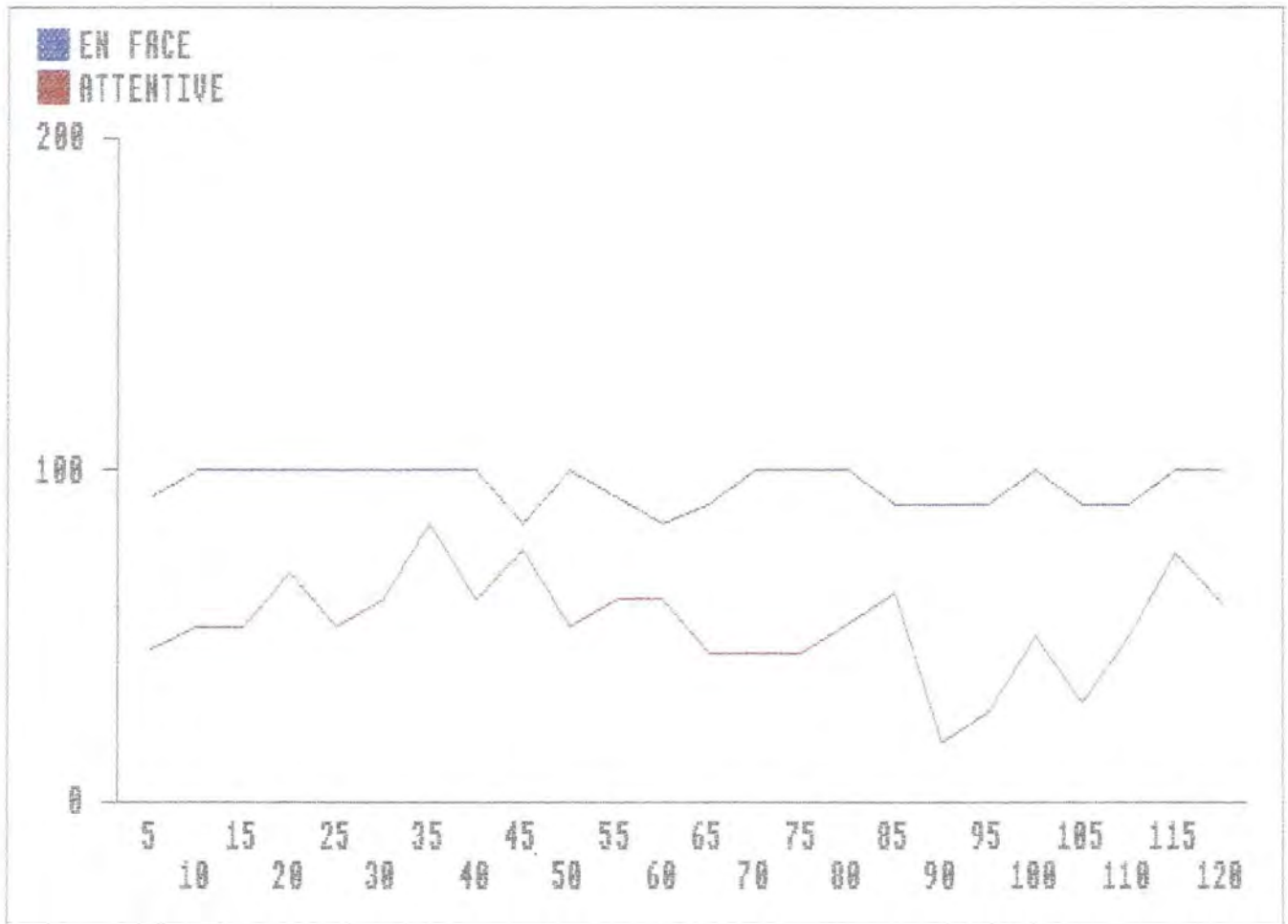
Child: DW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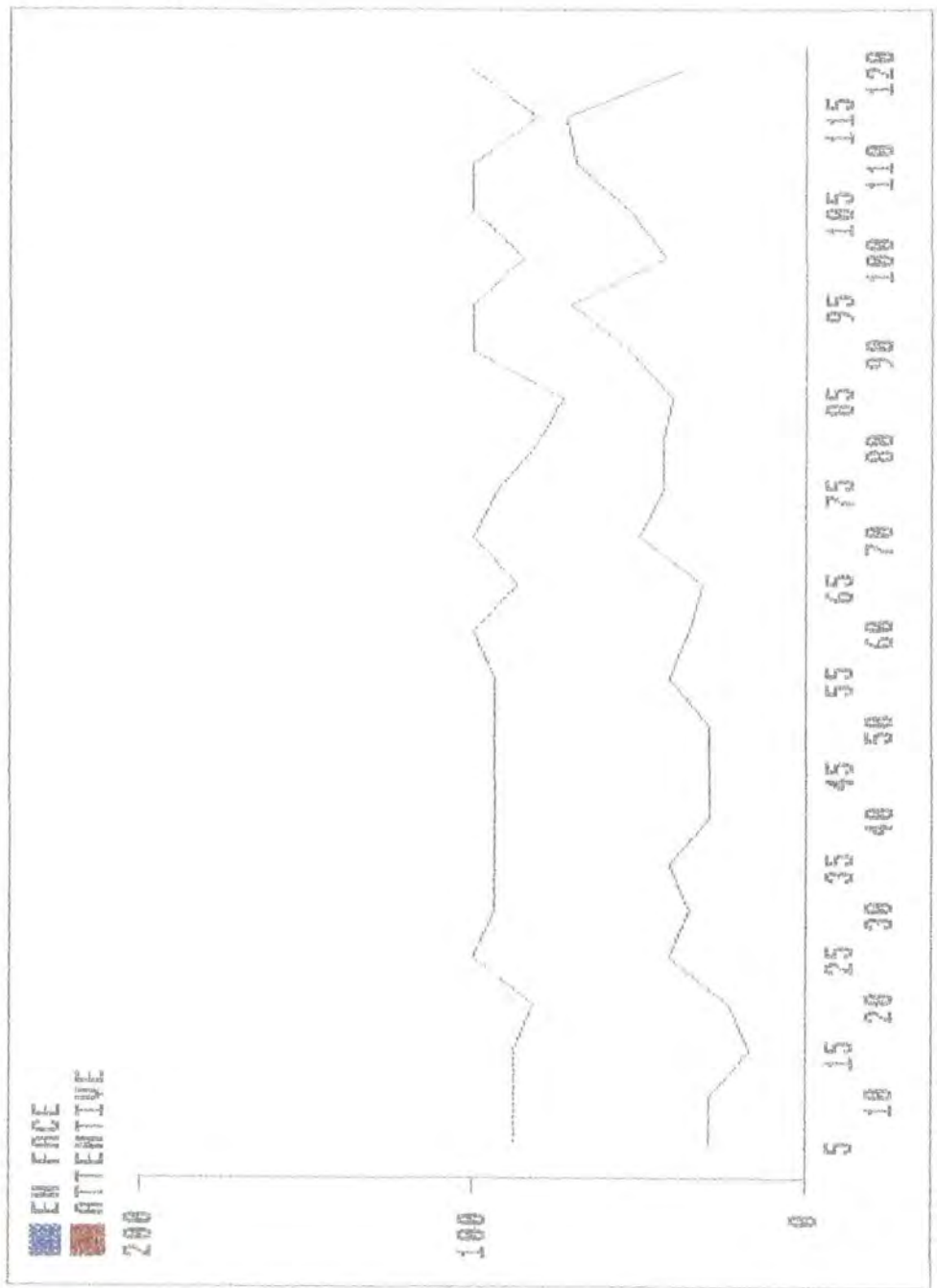
Child: JS

Child: MM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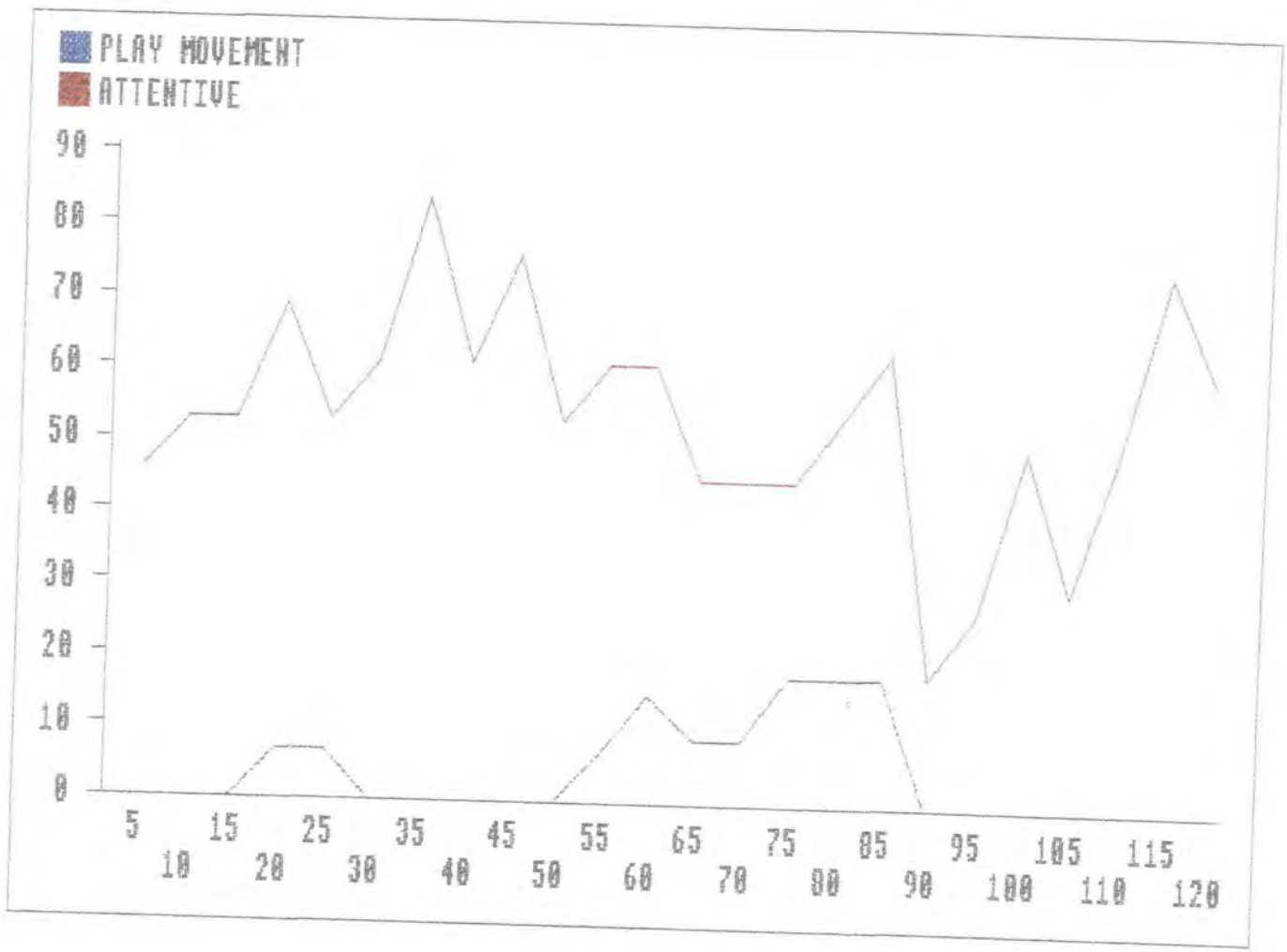
Appendix 5

Children's attentiveness and adult play movements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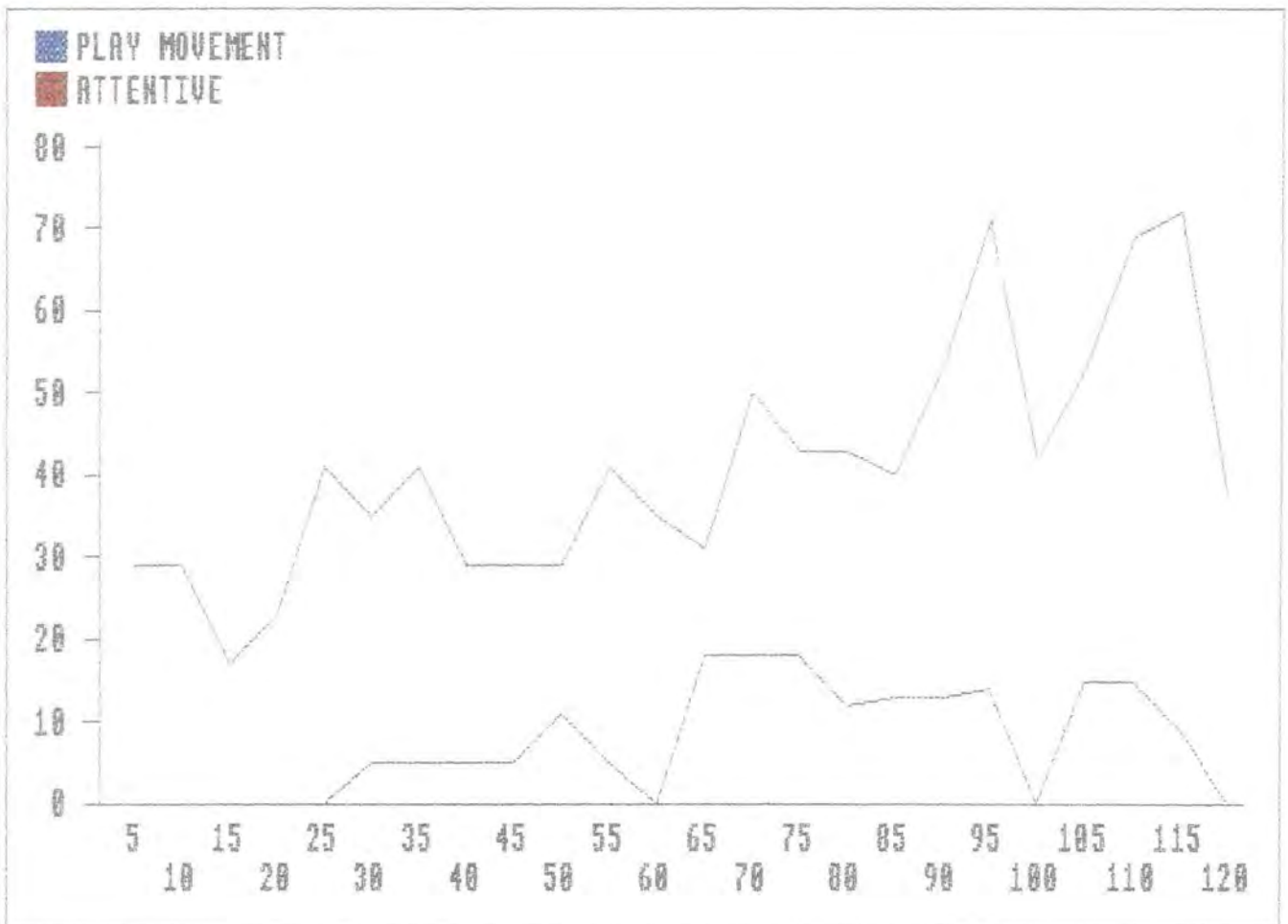
Child: JS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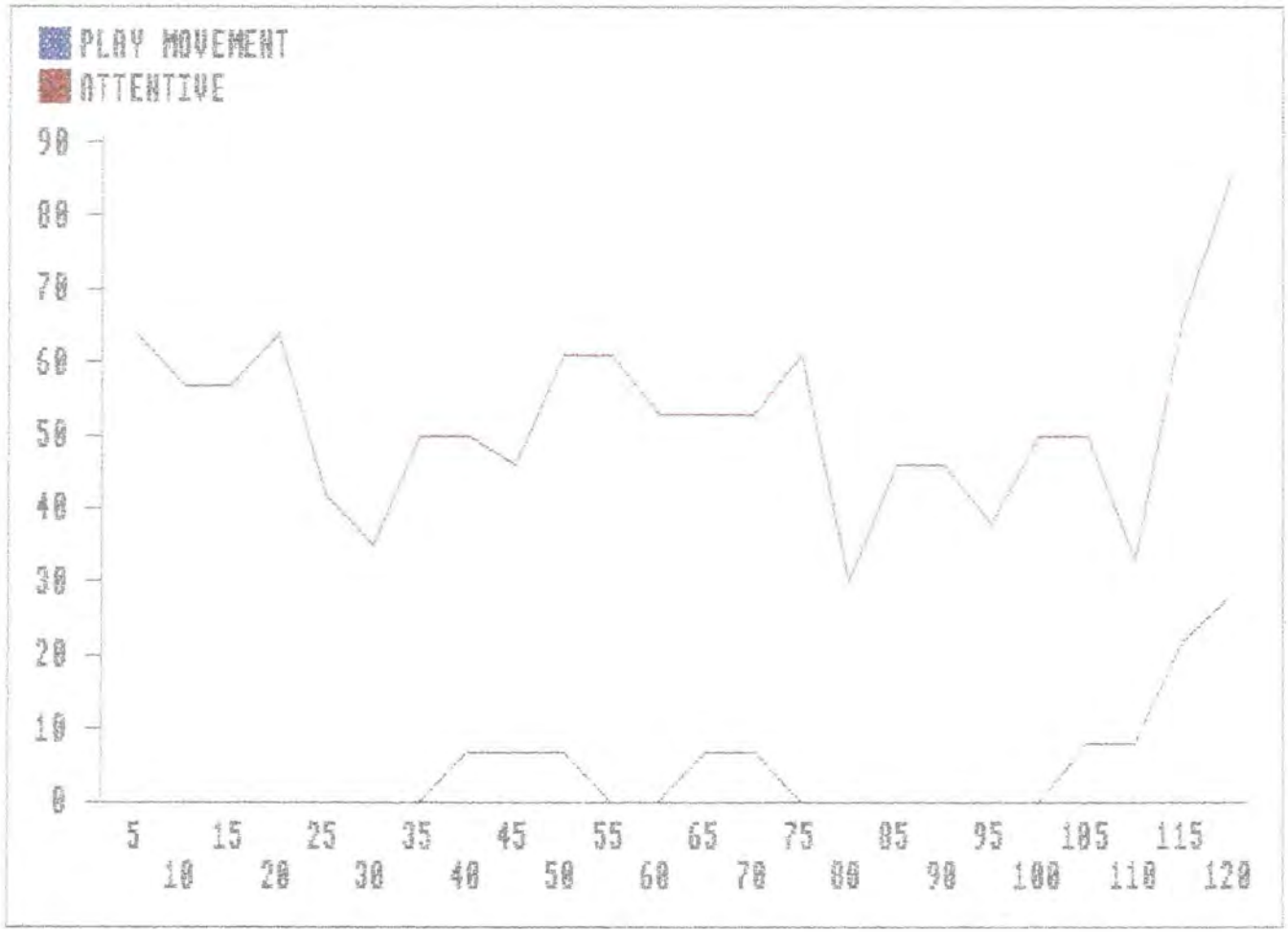
Child: MM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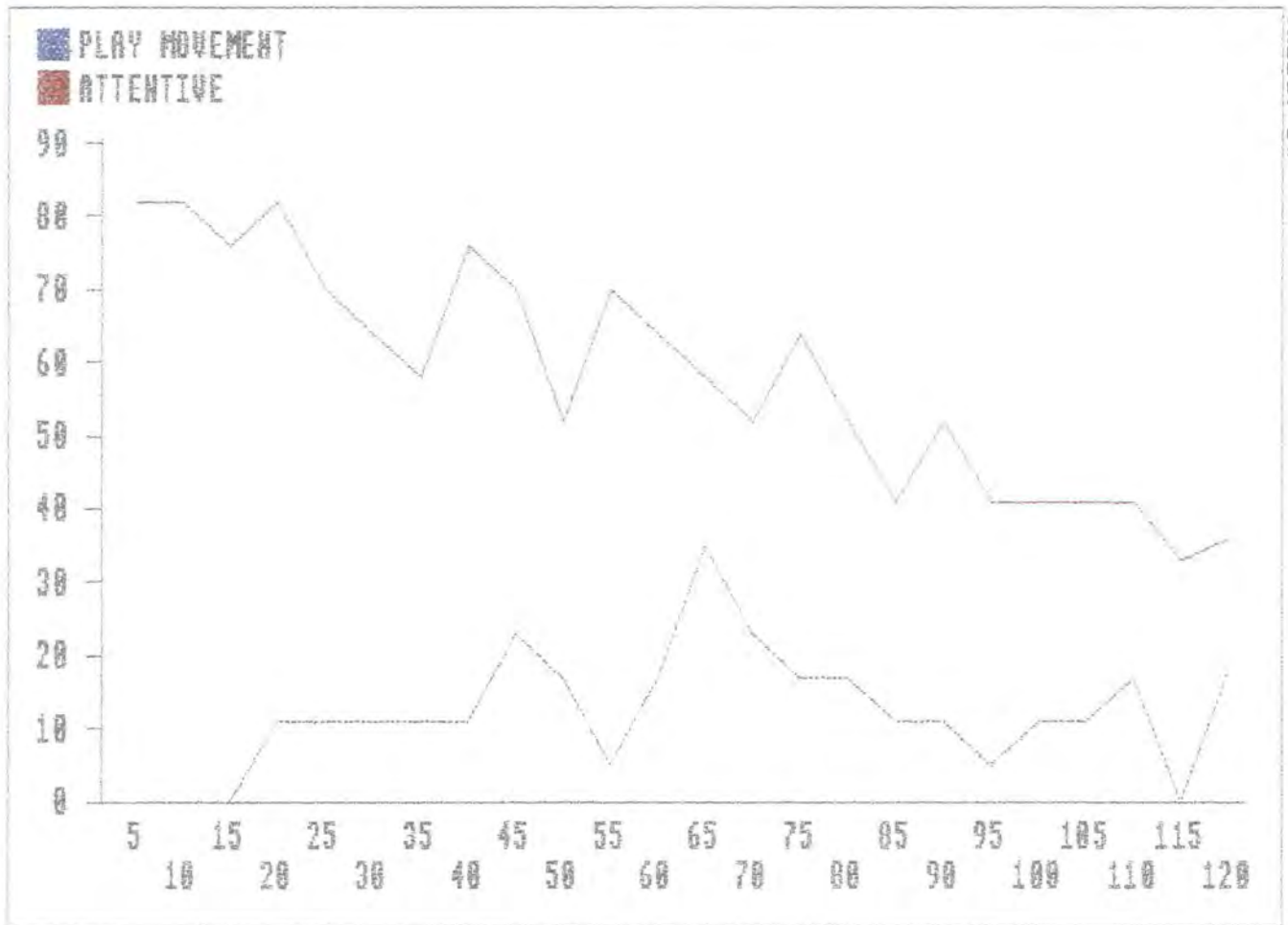
Child: AP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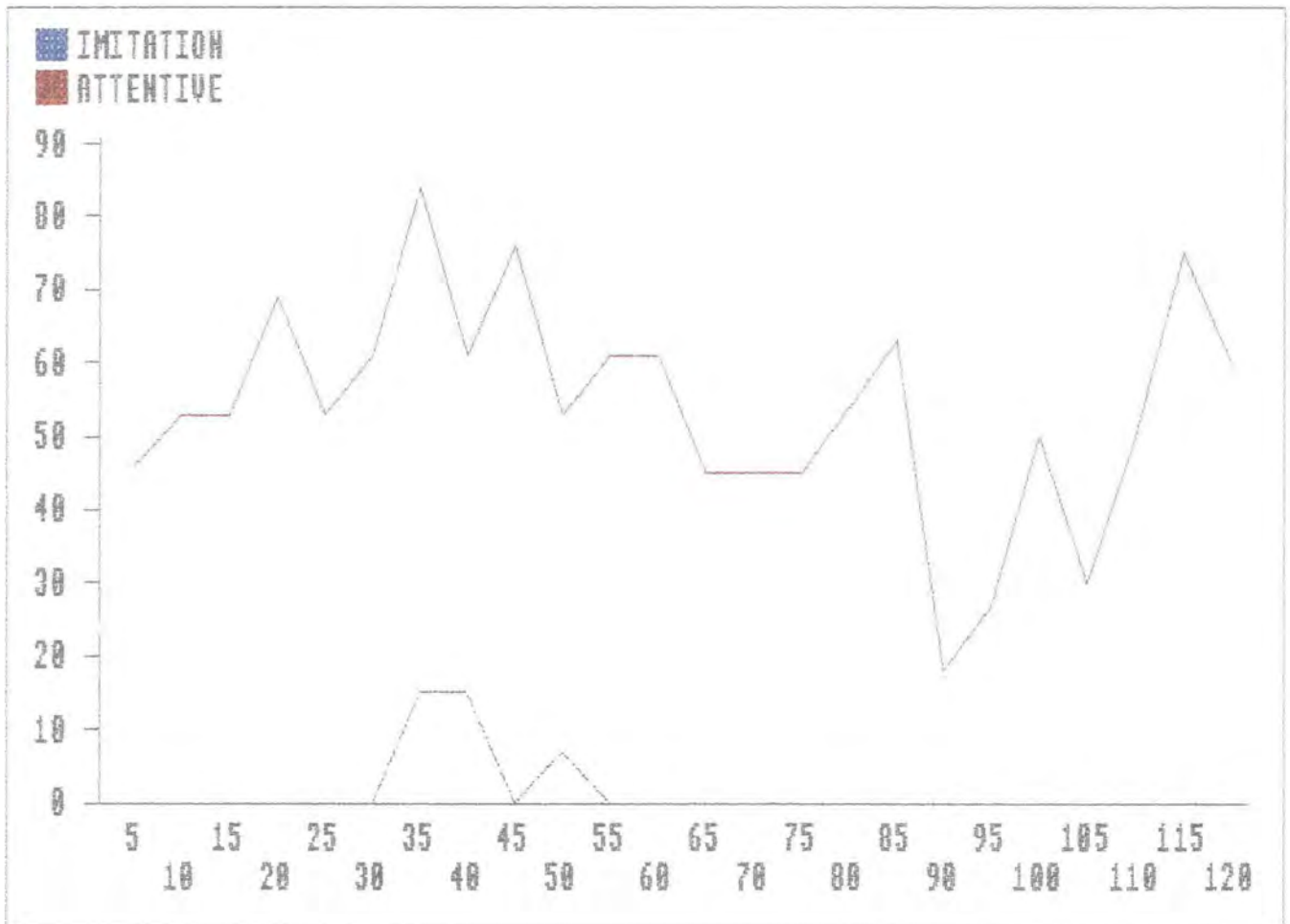
Child: DW

Appendix 6

Children's attentiveness and adult imitation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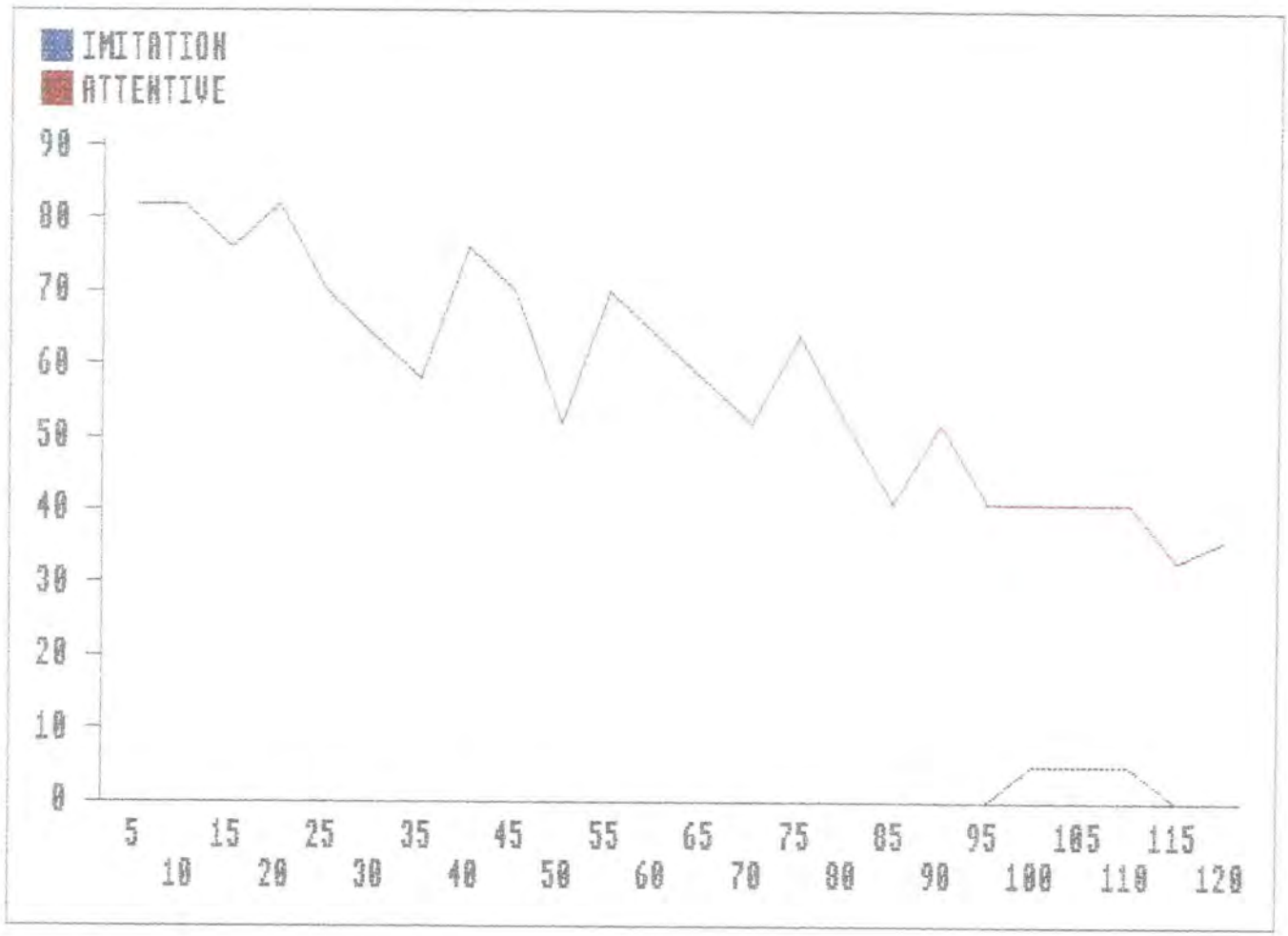
Child: JS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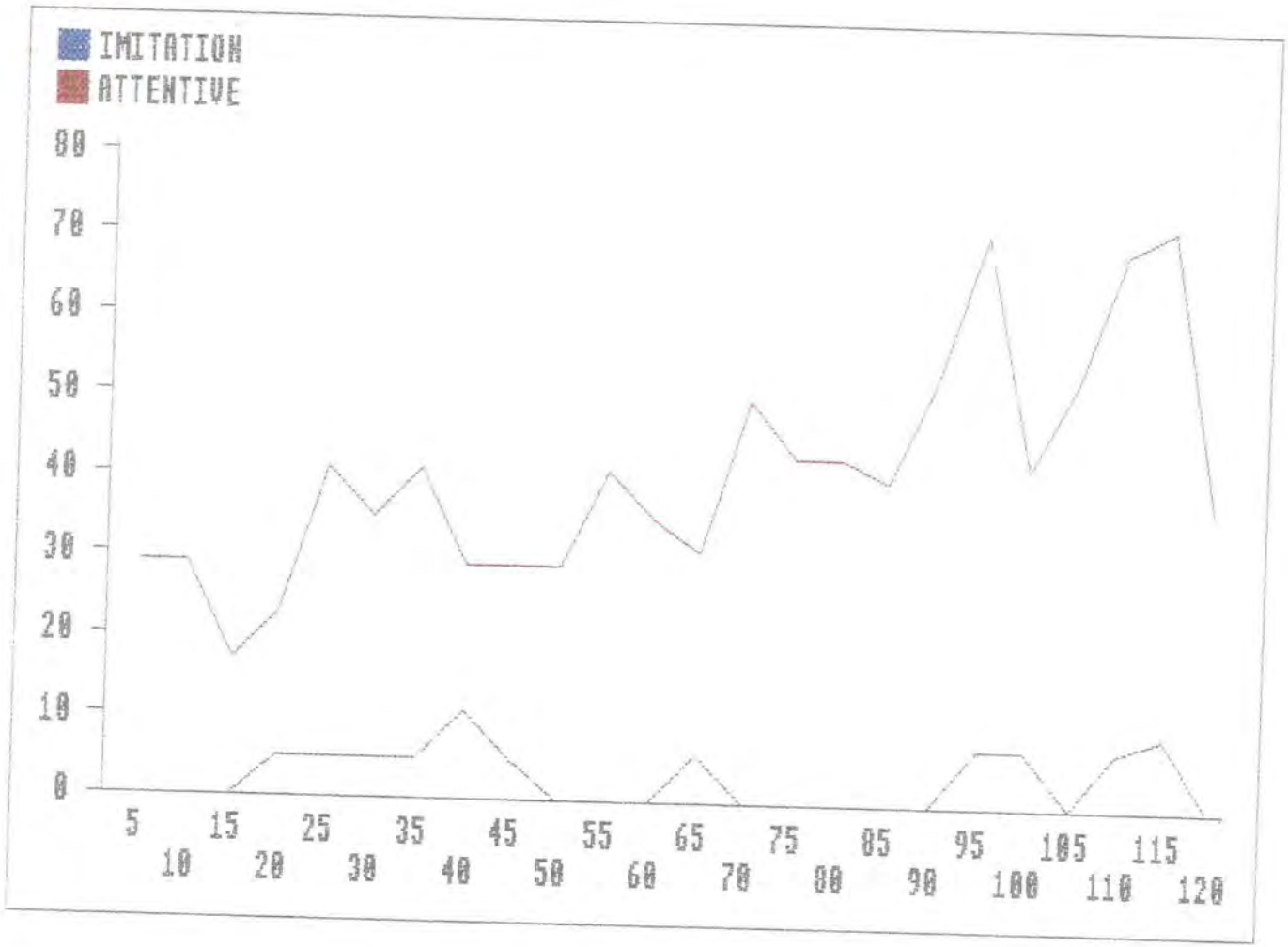
Child: DW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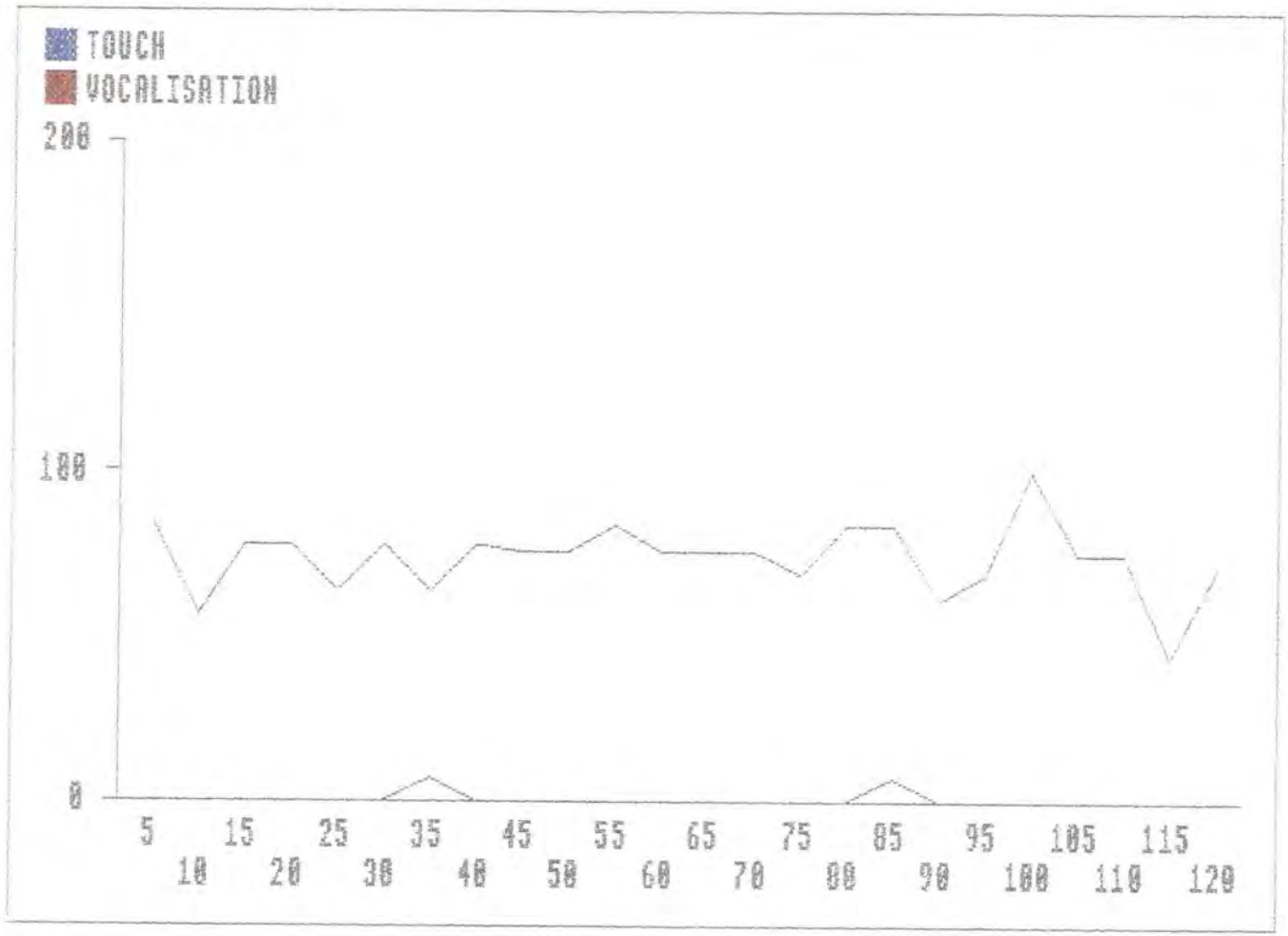
Child: MM

Appendix 7

Children's vocalisation and adult touch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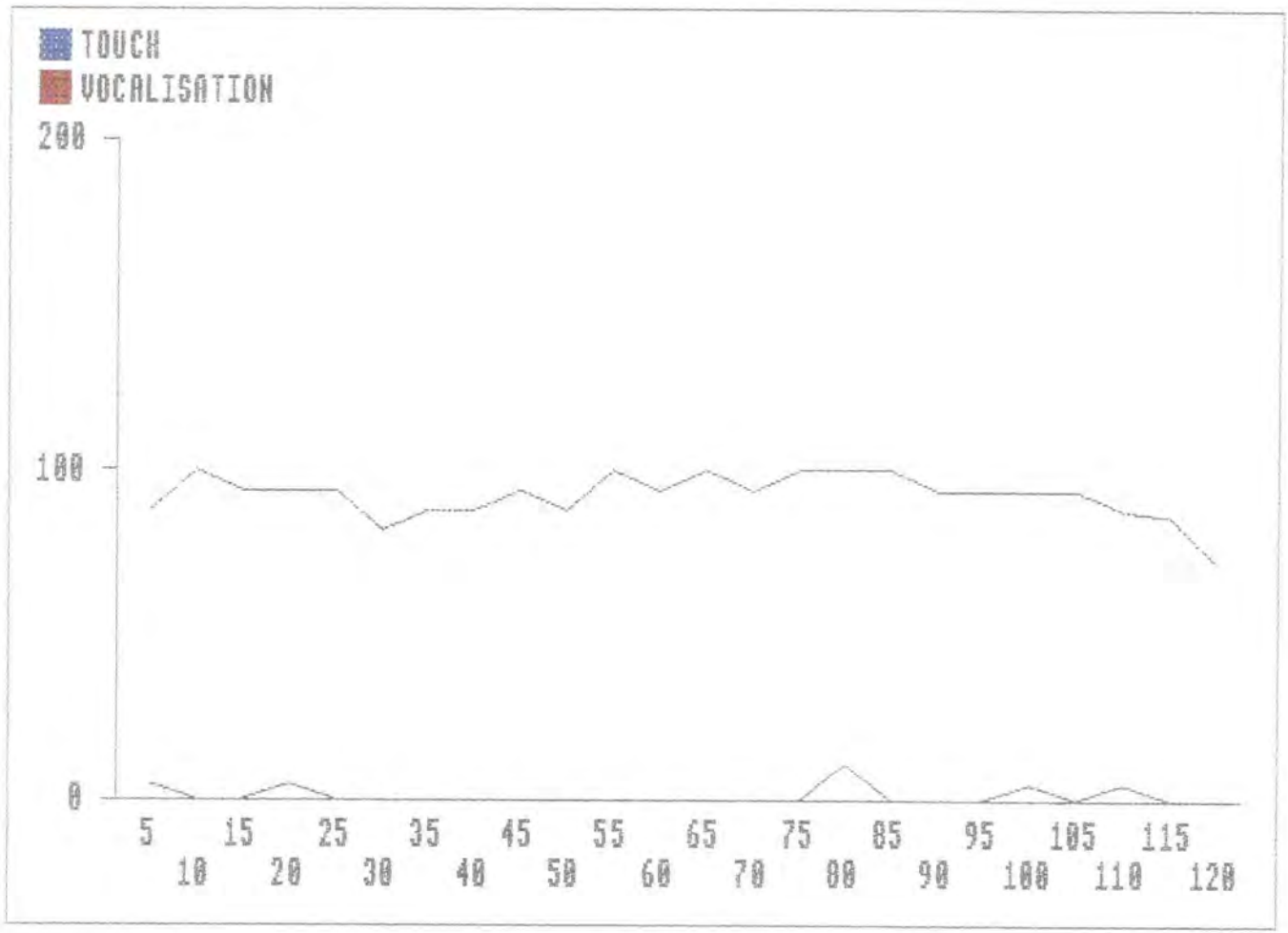
115
120

Child: AP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115
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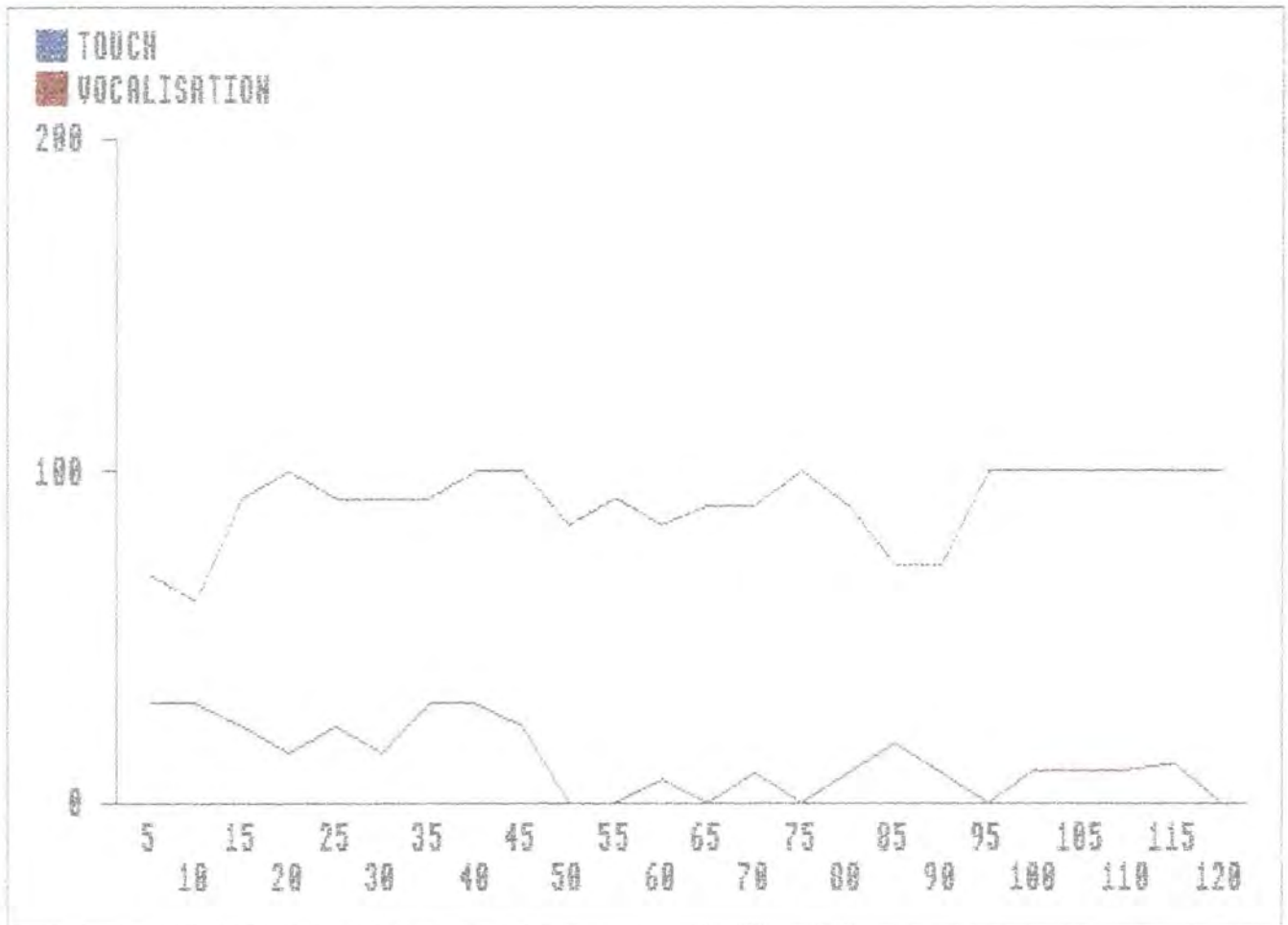
Child: DW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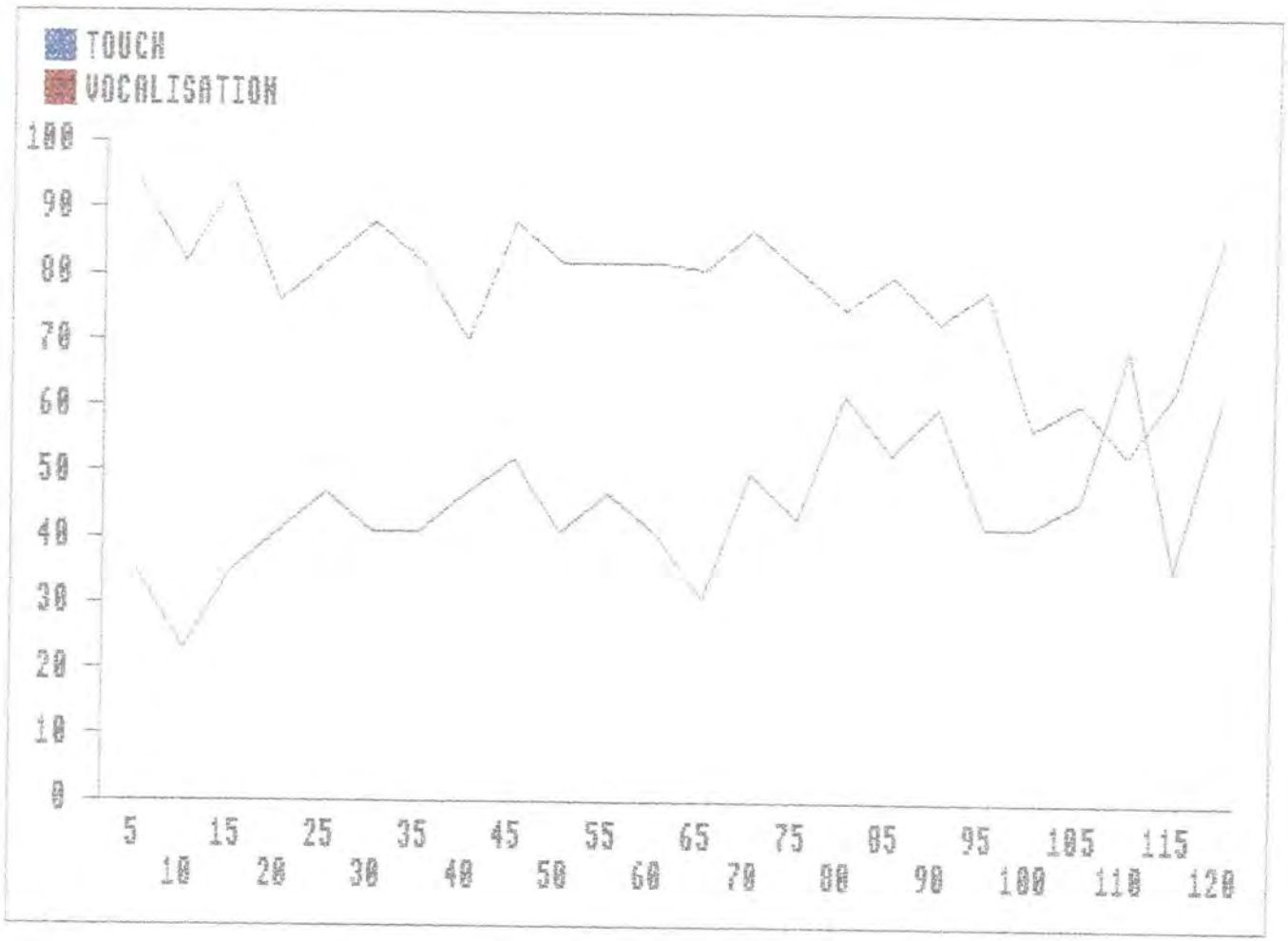
Child: JS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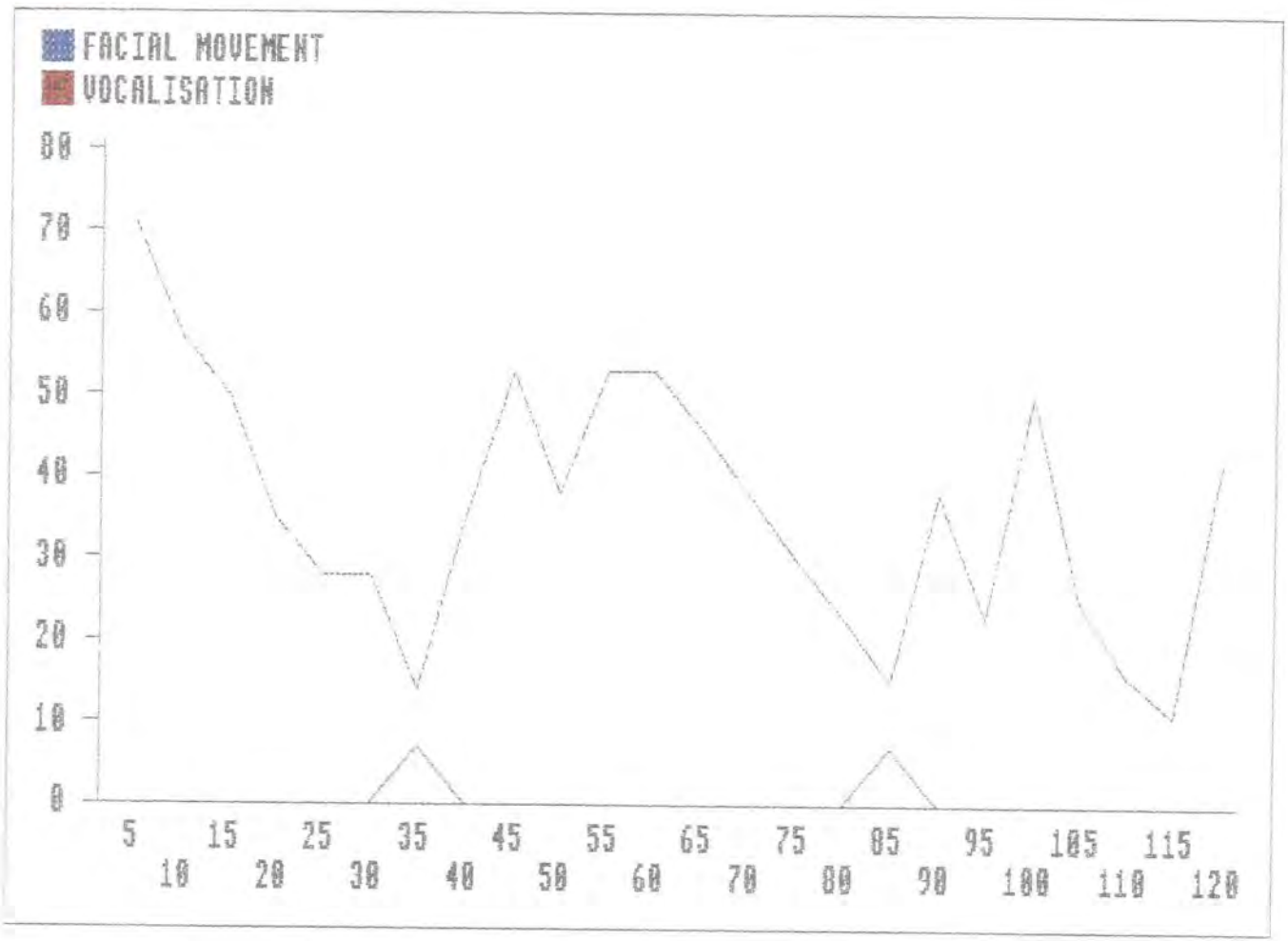
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

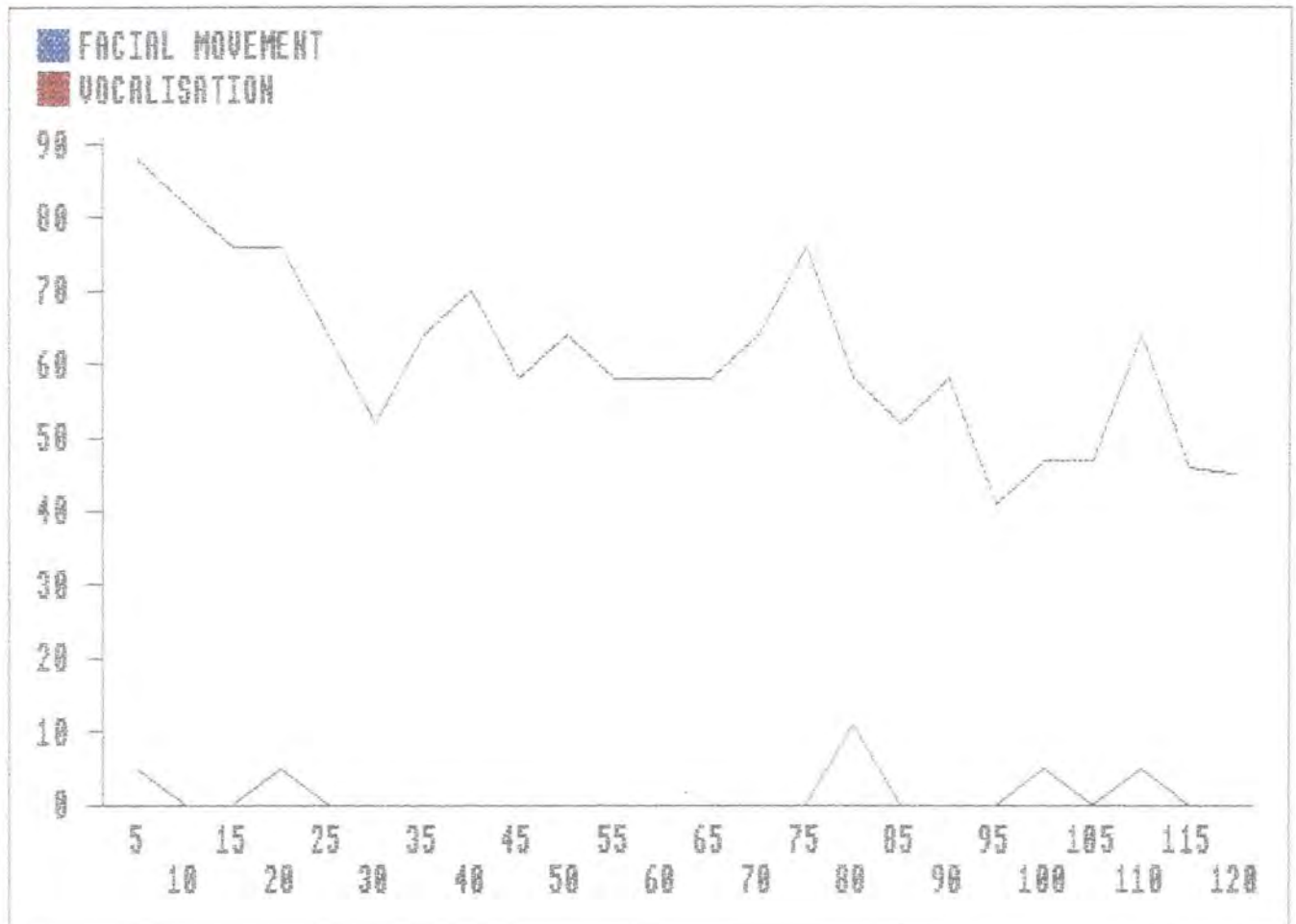
Child: MM

Appendix 8

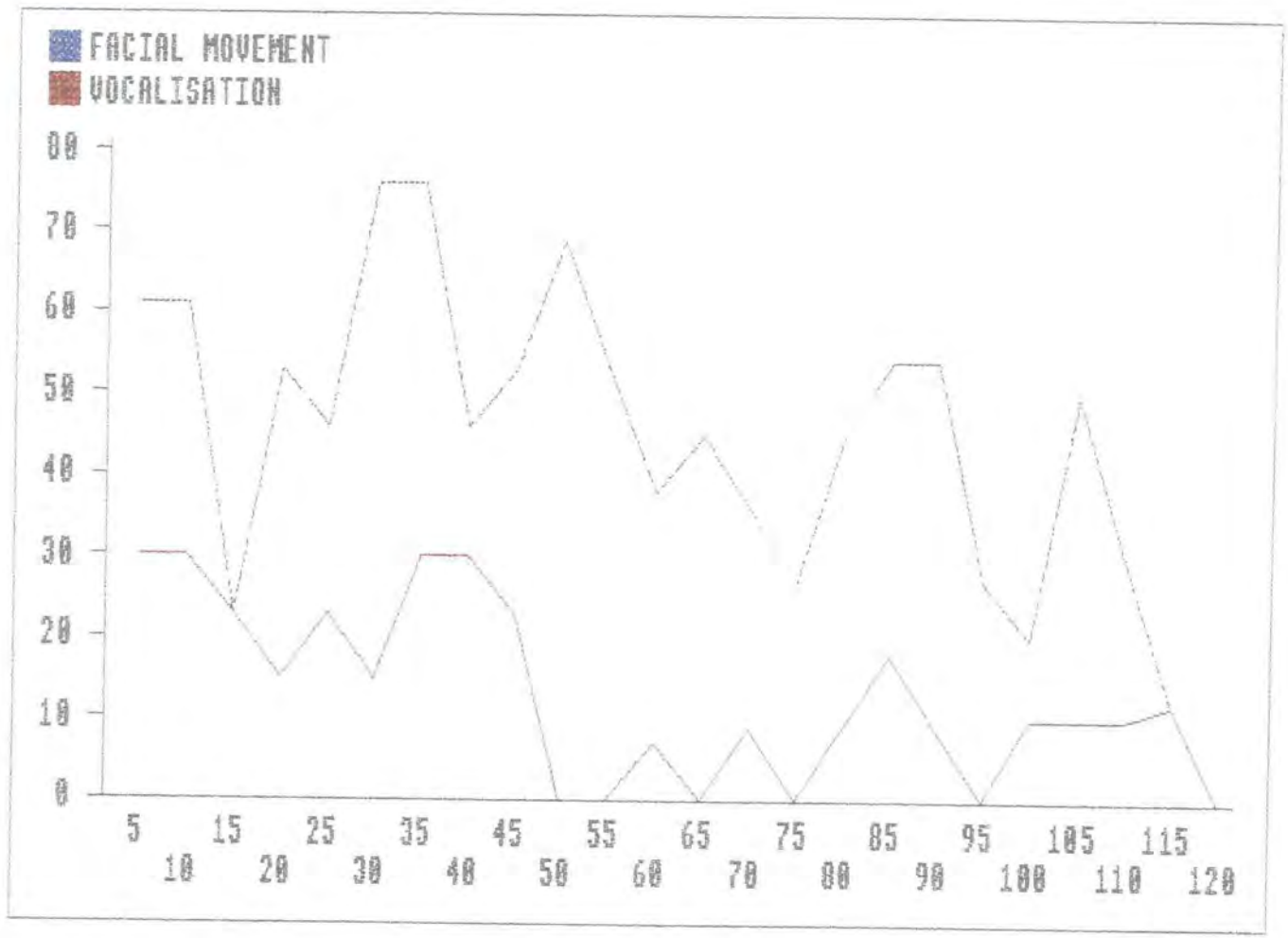
Children's vocalisation and adult facial movements


FACIAL MOVEMENT
VOCALISATION
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

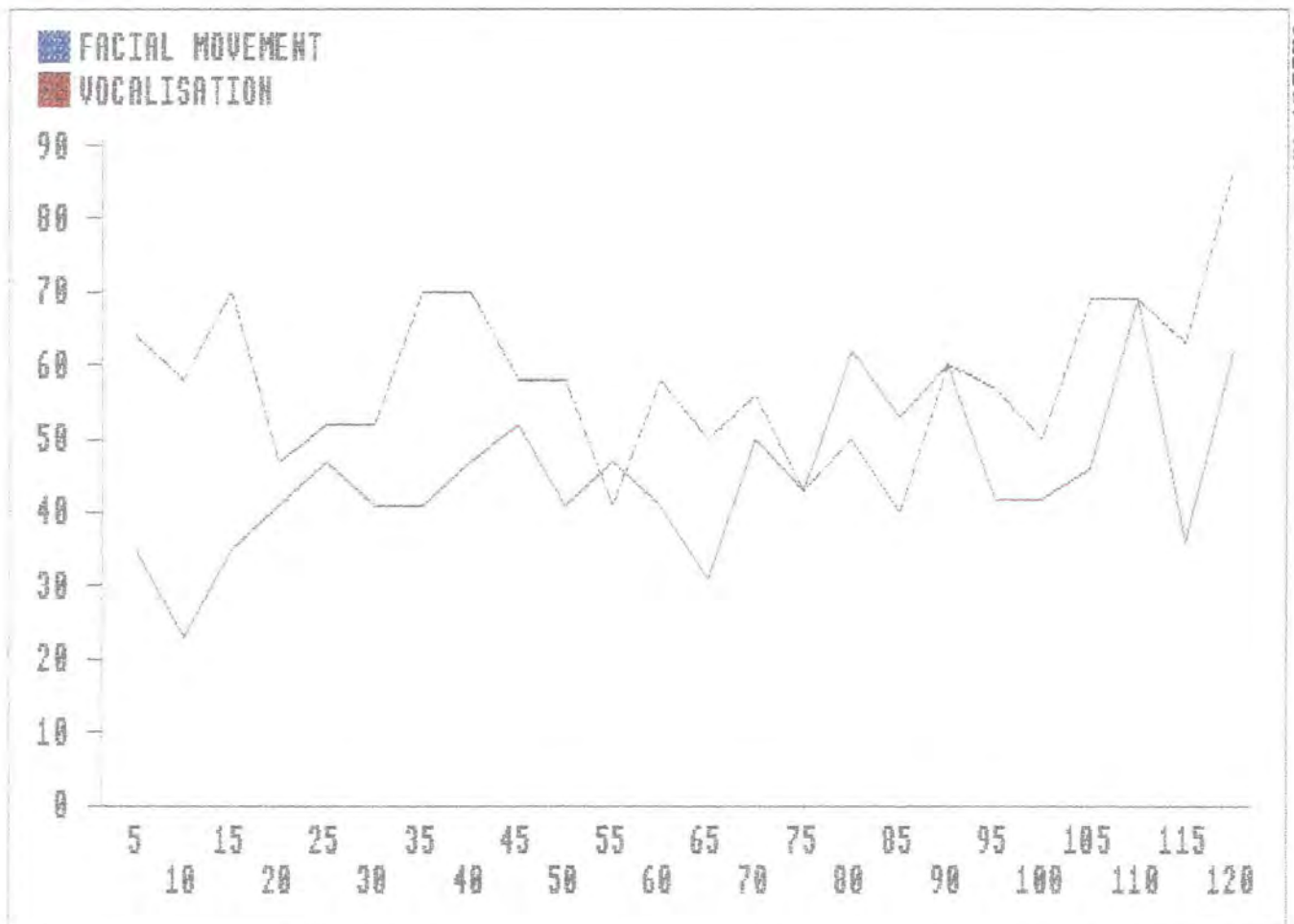
Child: AP


FACIAL MOVEMENT
VOCALISATION
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


FACIAL MOVEMENT
VOCALISATION
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

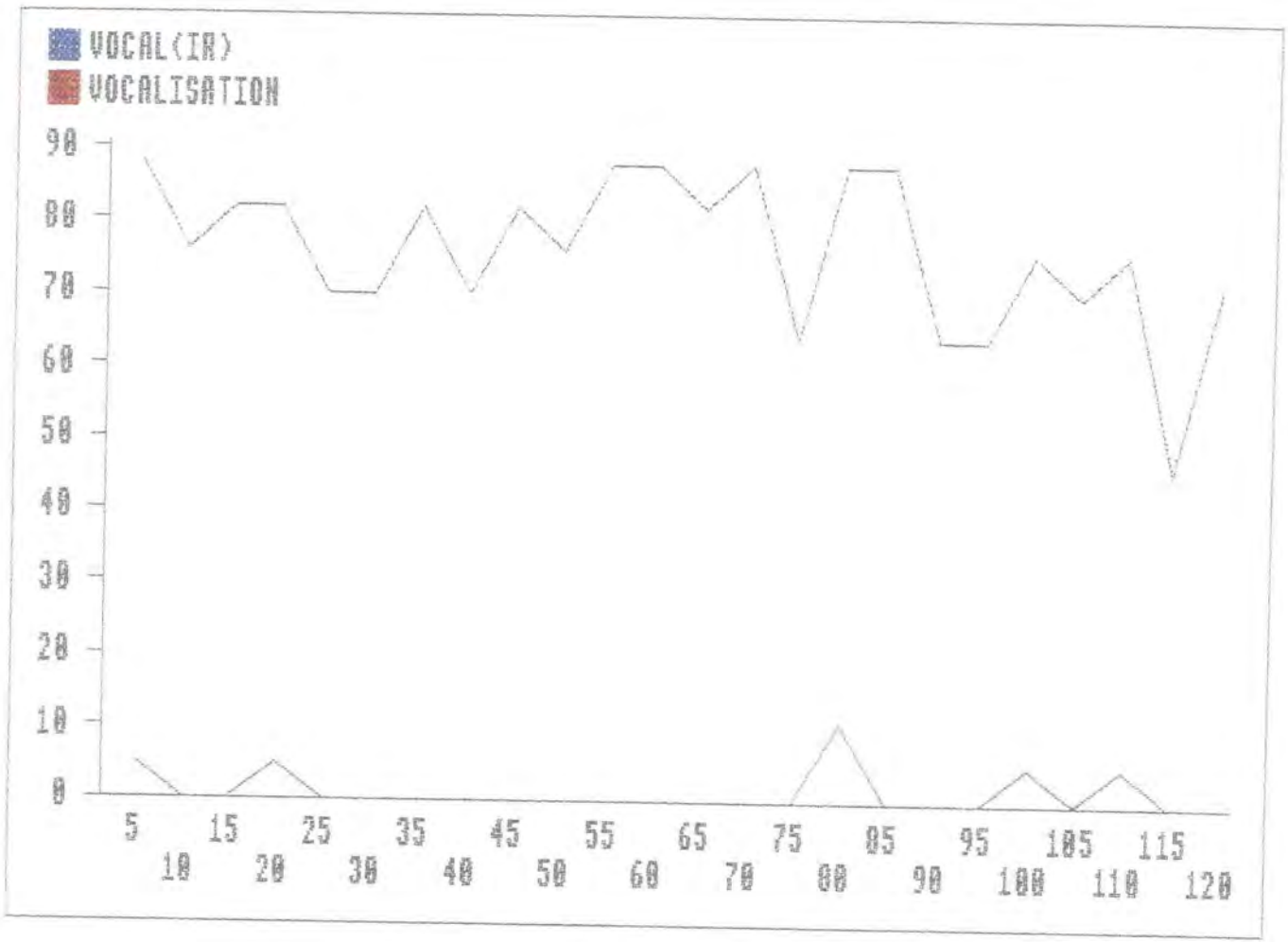
Child: JS


FACIAL MOVEMENT
VOCALISATION
90
80
70
60
50
40
30
20
10
0
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120

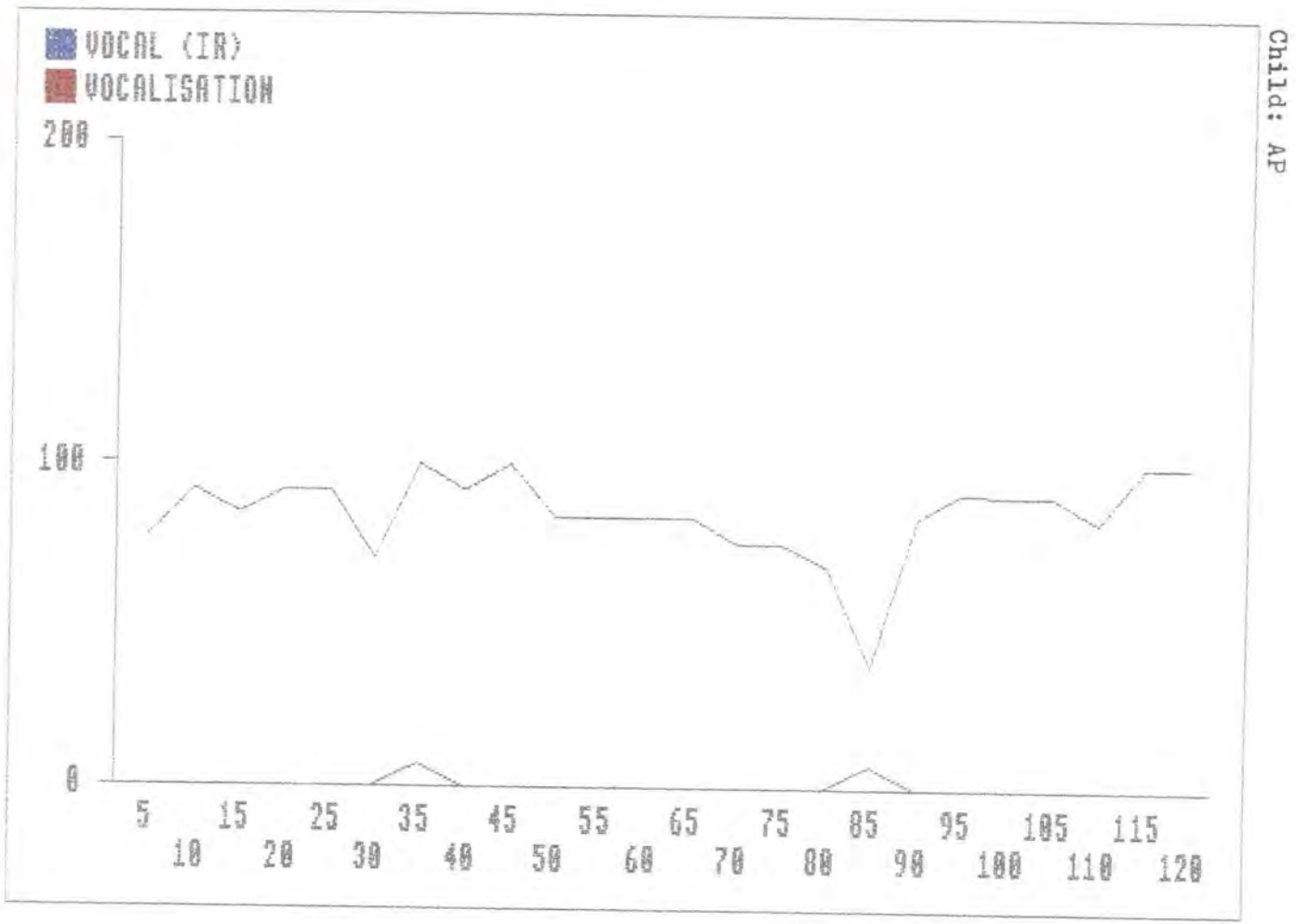
Child: MM

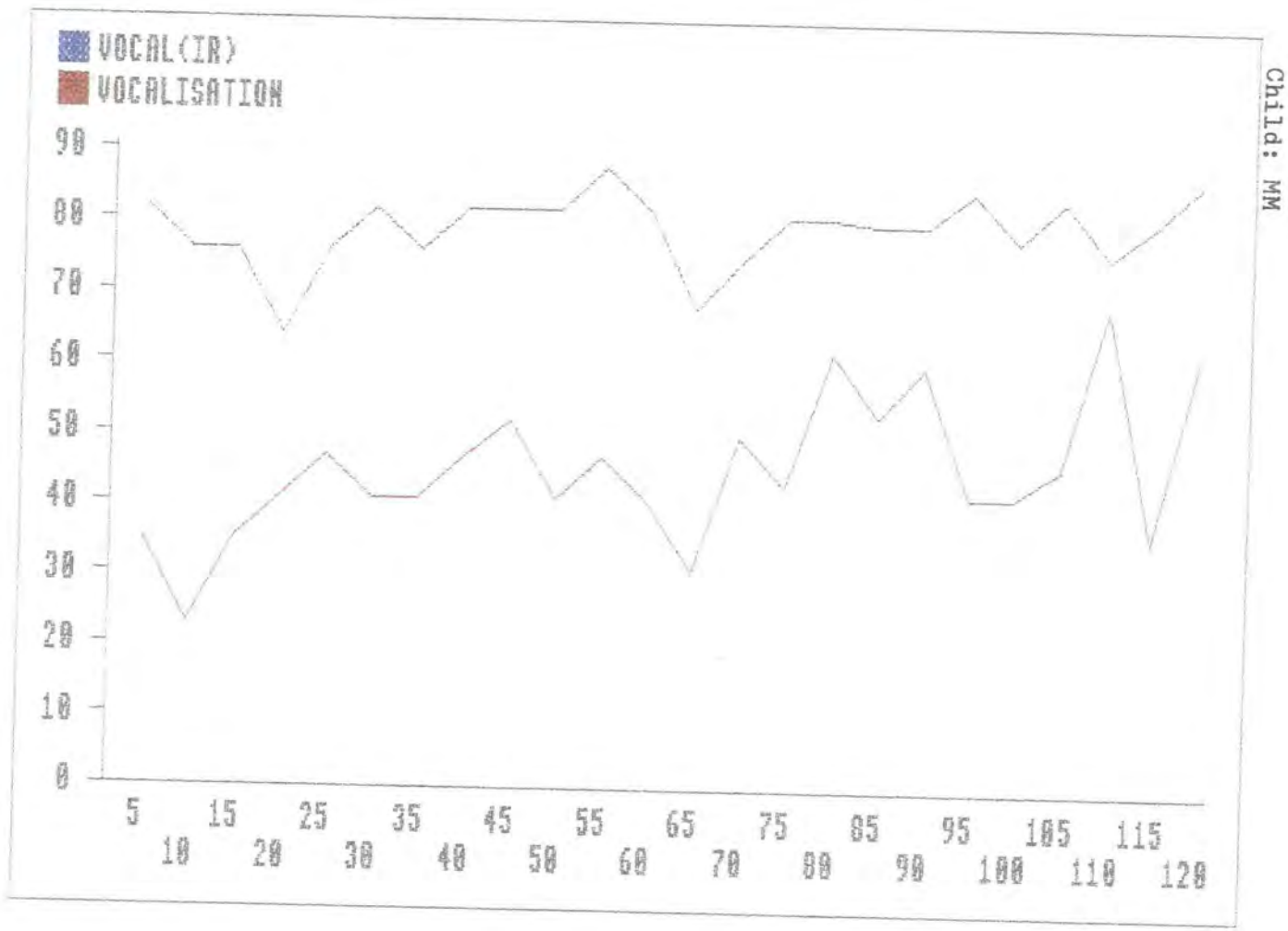
Appendix 9

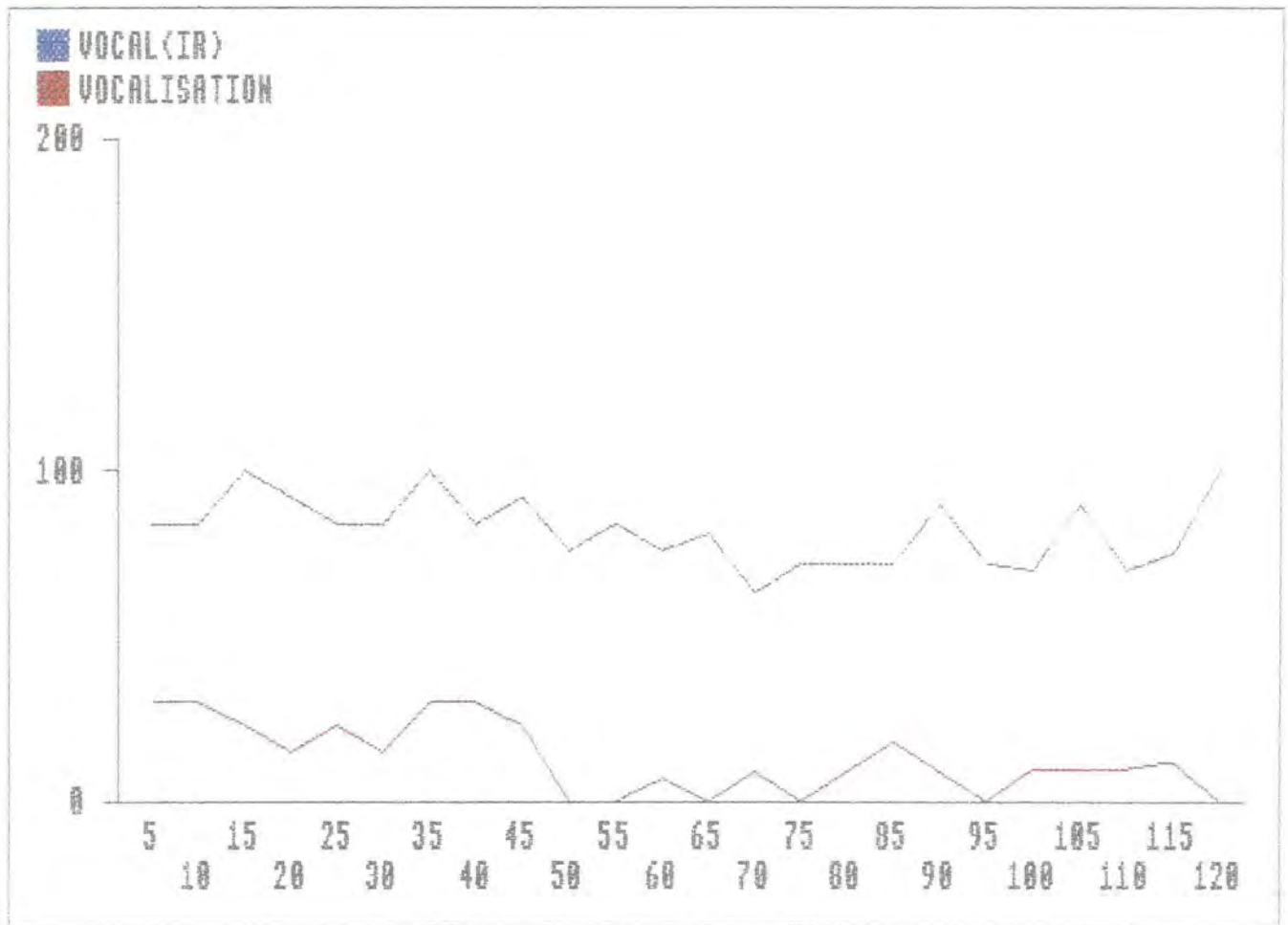
Children's vocalisation and adult vocalisation


VOCAL(IR)
VOCALISATION
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


VOCAL (IR)
VOCALISATION
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
Child: AP

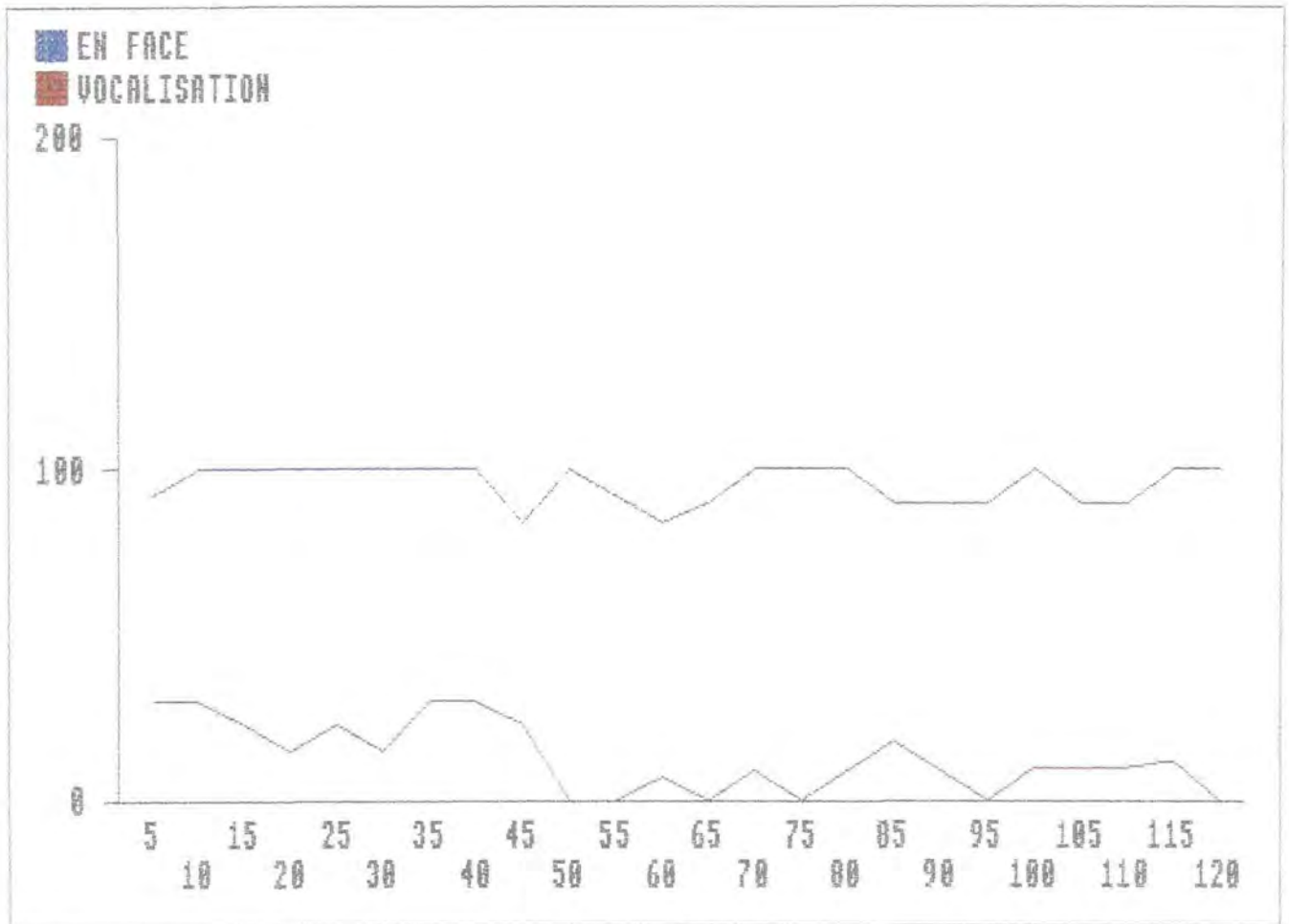

VOCAL(IR)
VOCALISATION
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
Child: MM


VOCAL(IR)
VOCALISATION
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

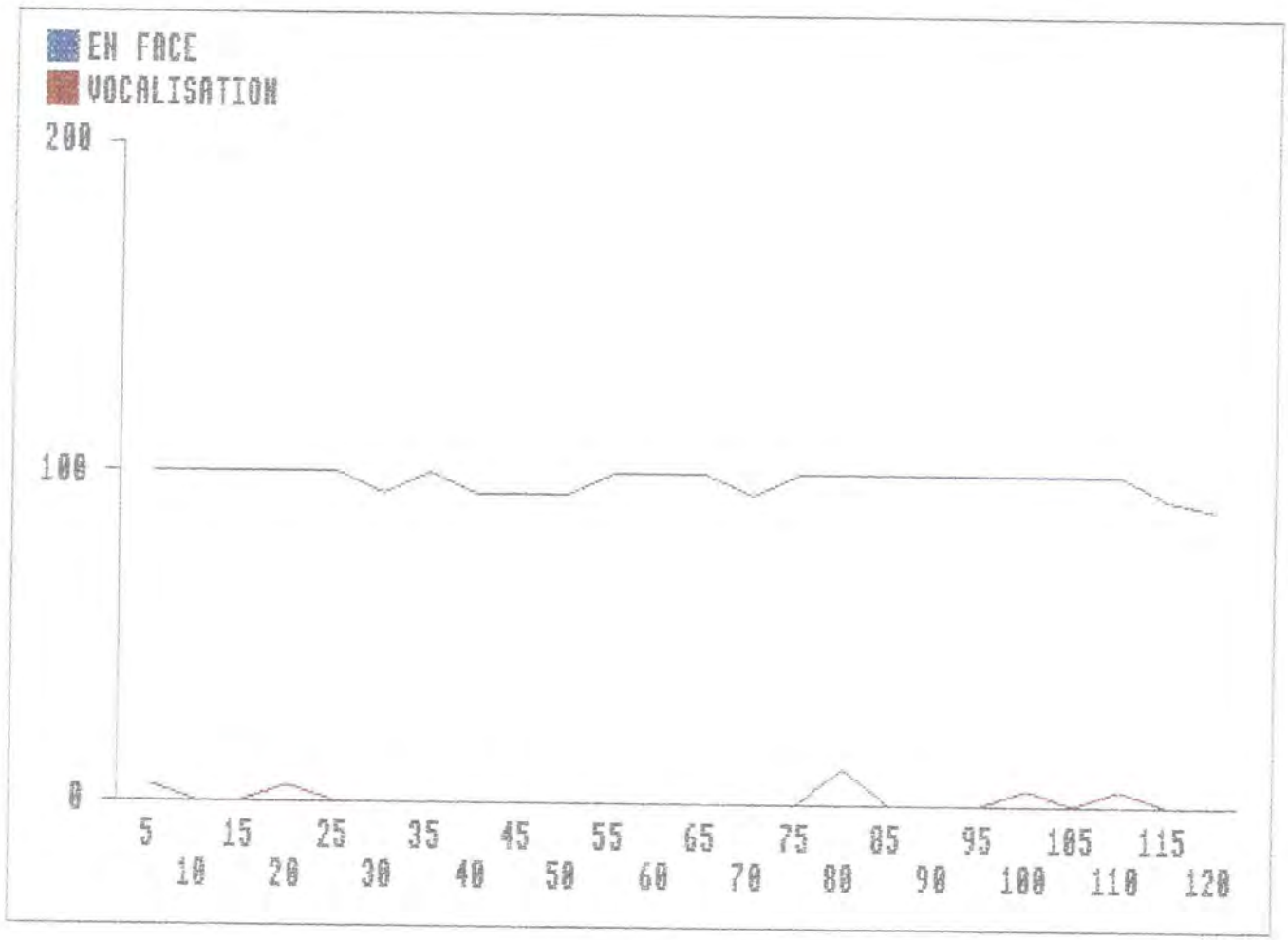
Child: JS

Appendix 10

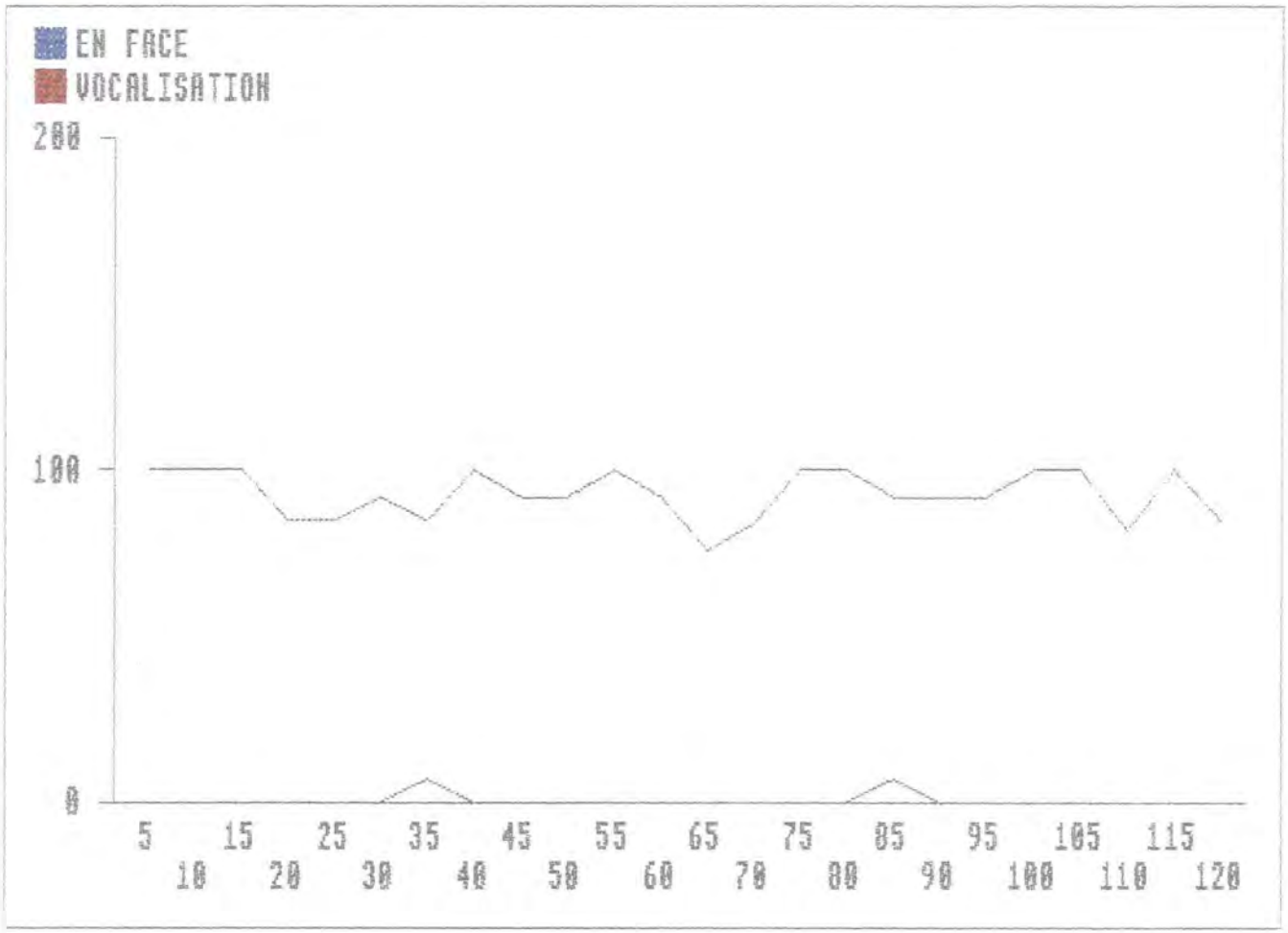
Children's vocalisation and adult en face behaviour


EN FACE
VOCALISATION
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

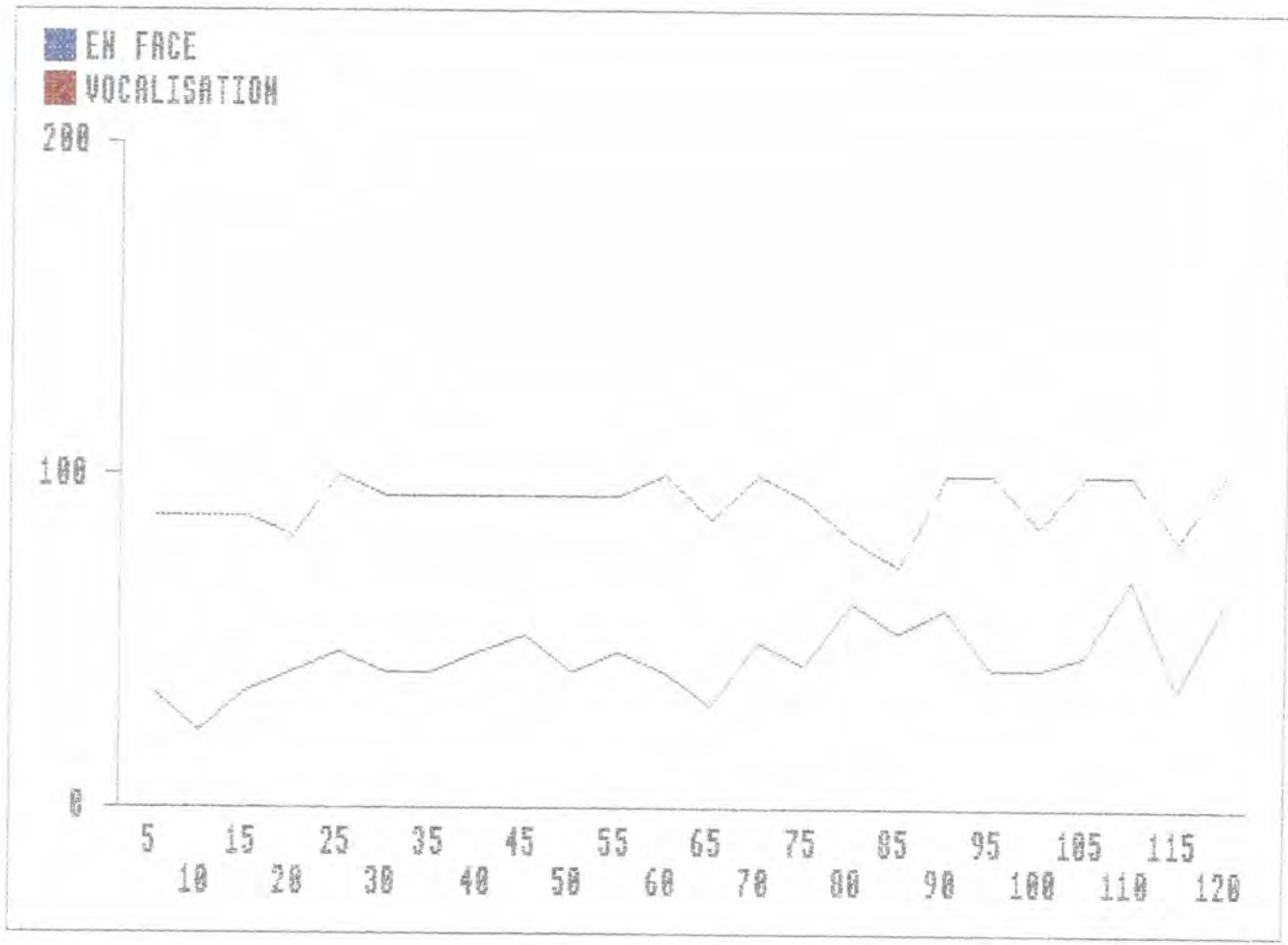
Child: JS


EN FACE
VOCALISATION
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


EN FACE
VOCALISATION
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

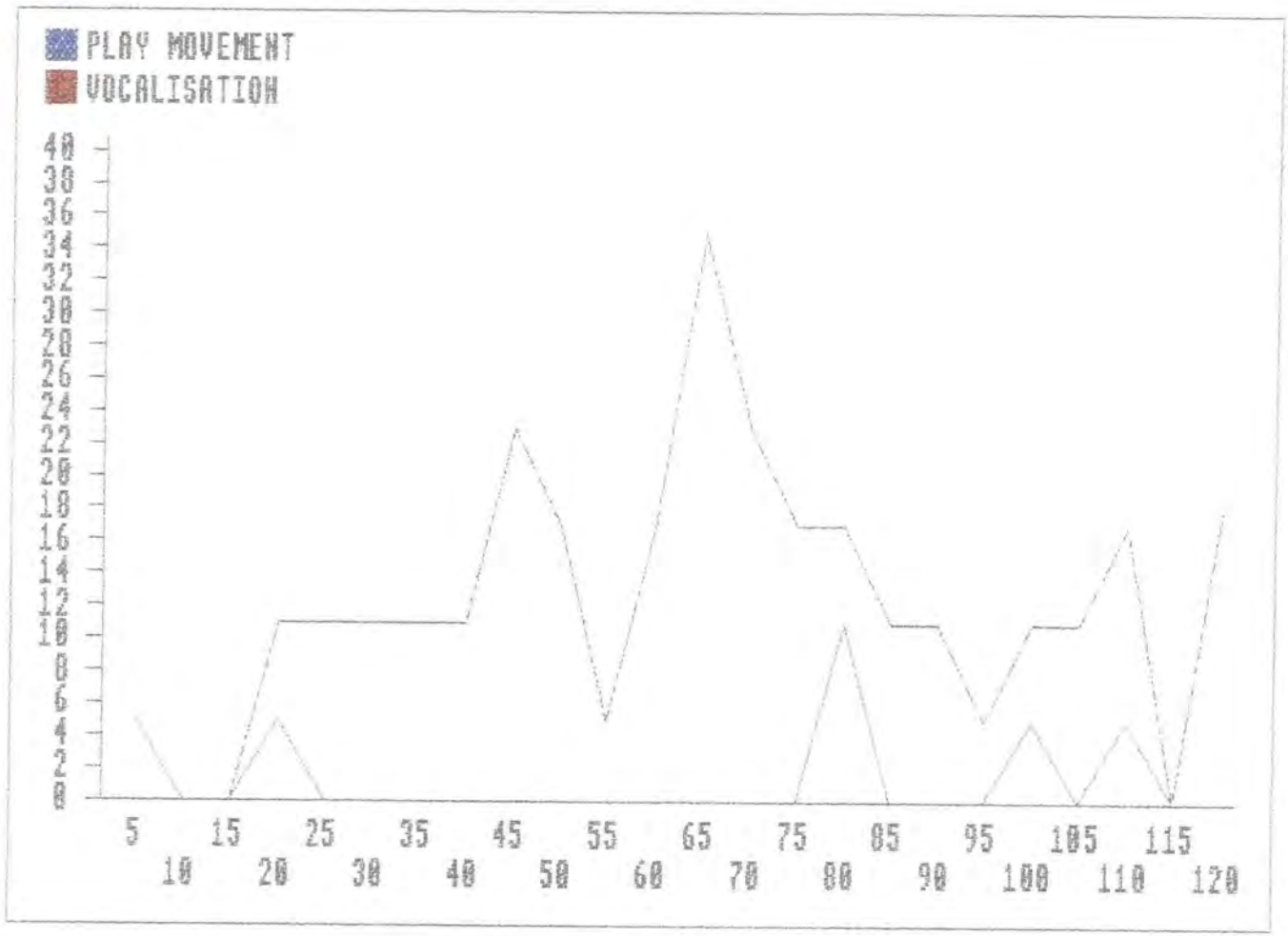
Child: AP


EN FACE
VOCALISATION
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: MM

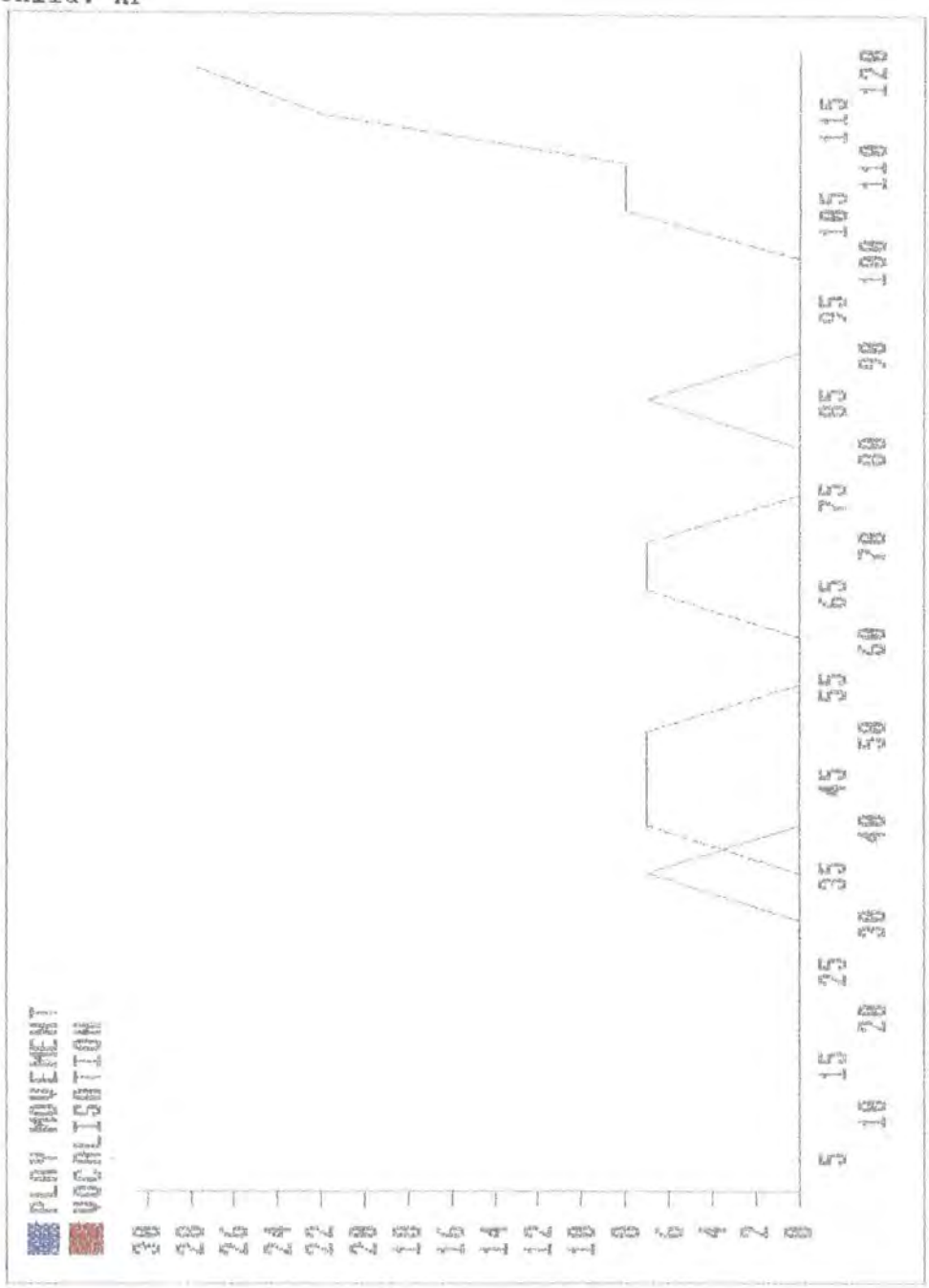
Appendix 11

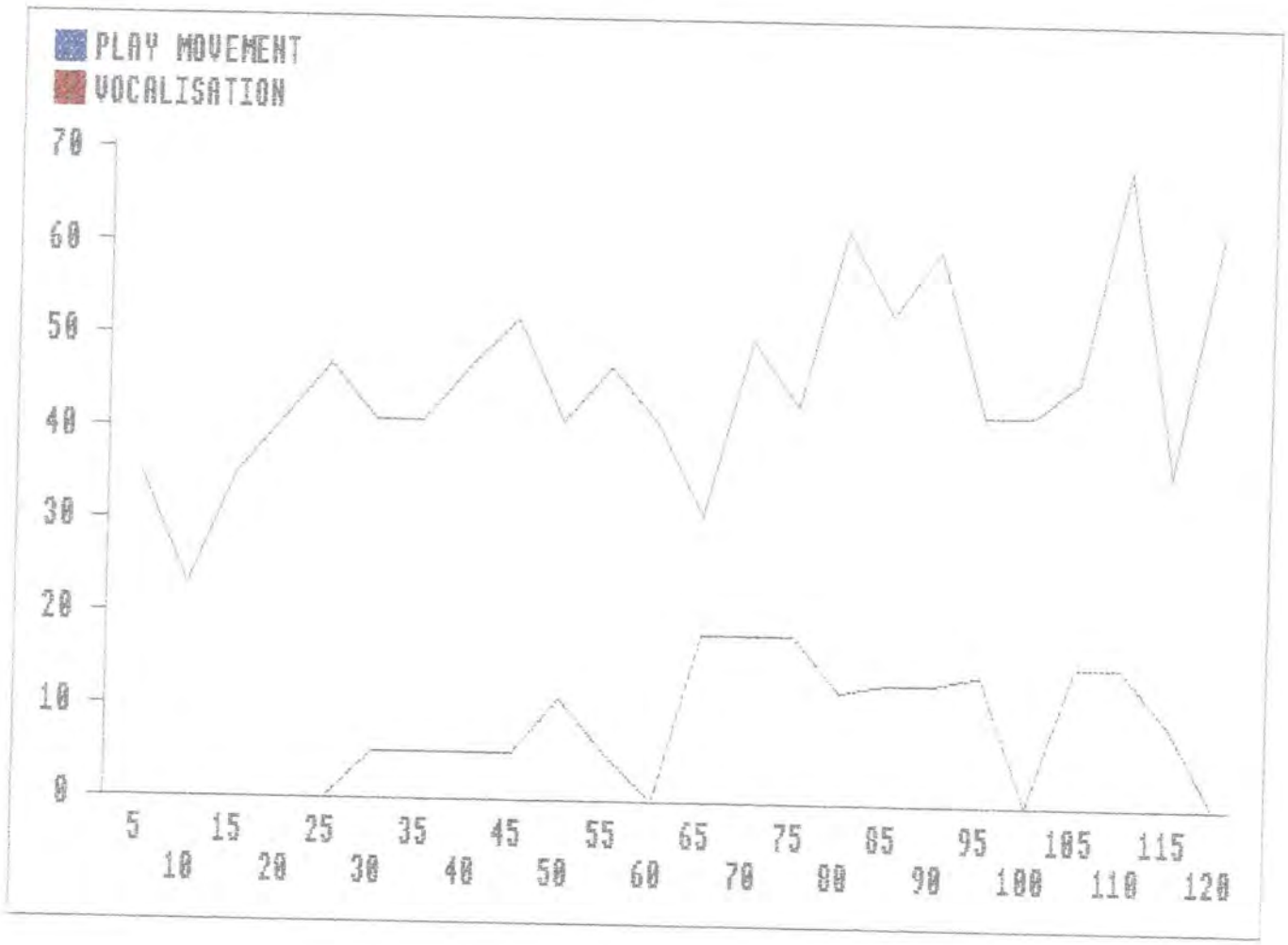
Children's vocalisation and adult play movements


PLAY MOVEMENT
VOCALISATION
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

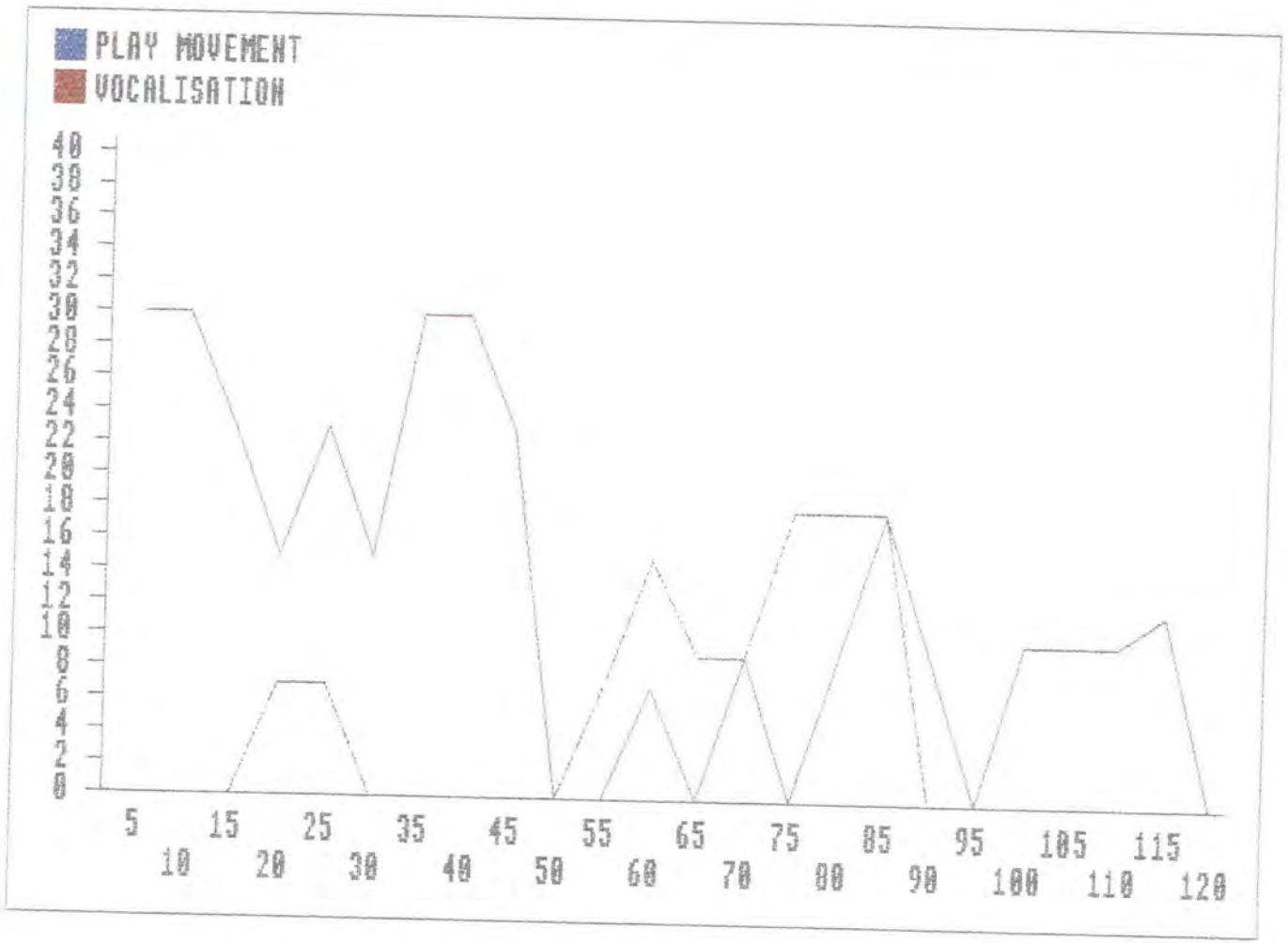
Child: DW

Child: AP


PLAY MOVEMENT
VOCALISATION
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120


PLAY MOVEMENT
VOCALISATION
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

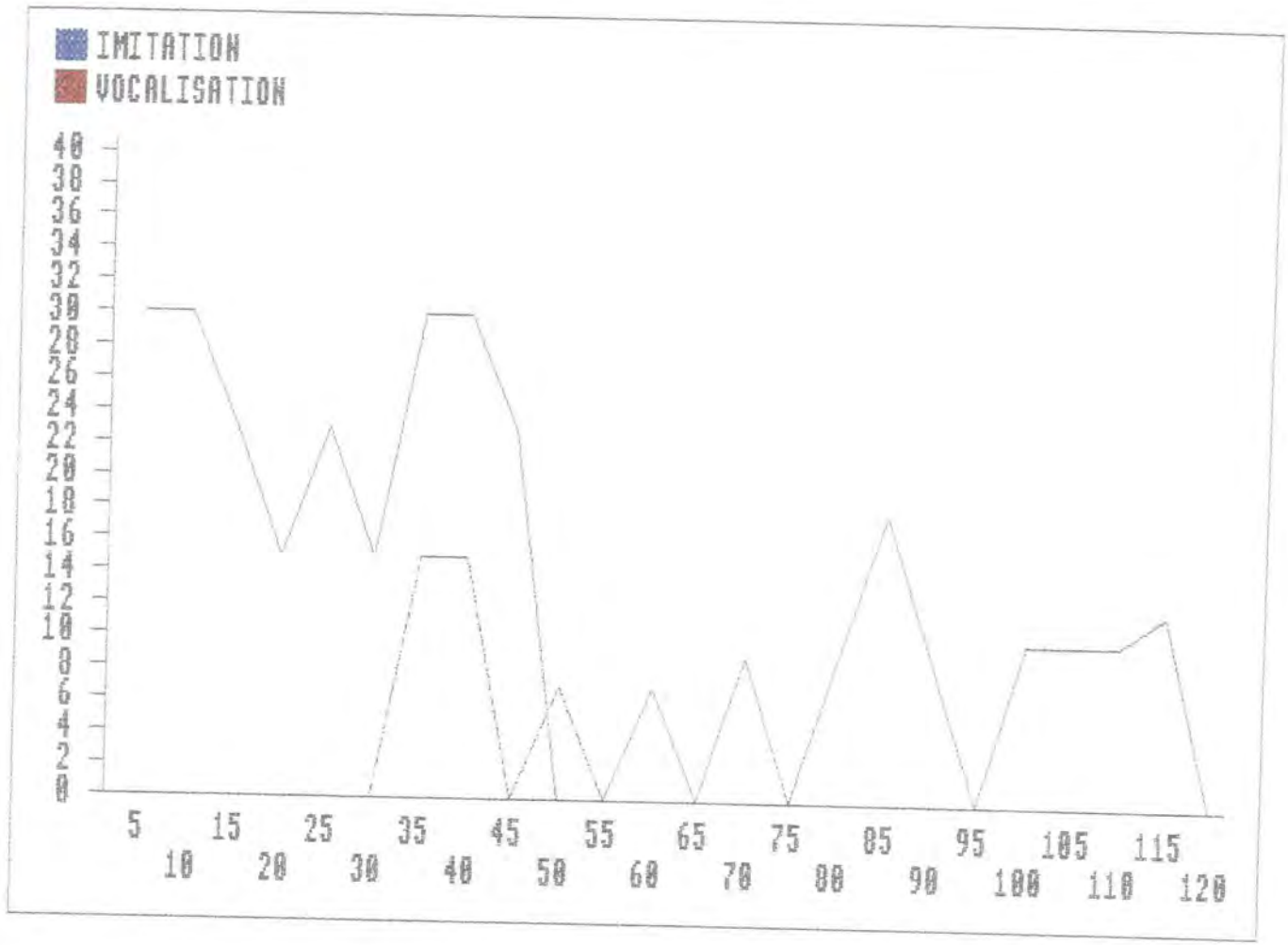
Child: MM


PLAY MOVEMENT
VOCALISATION
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

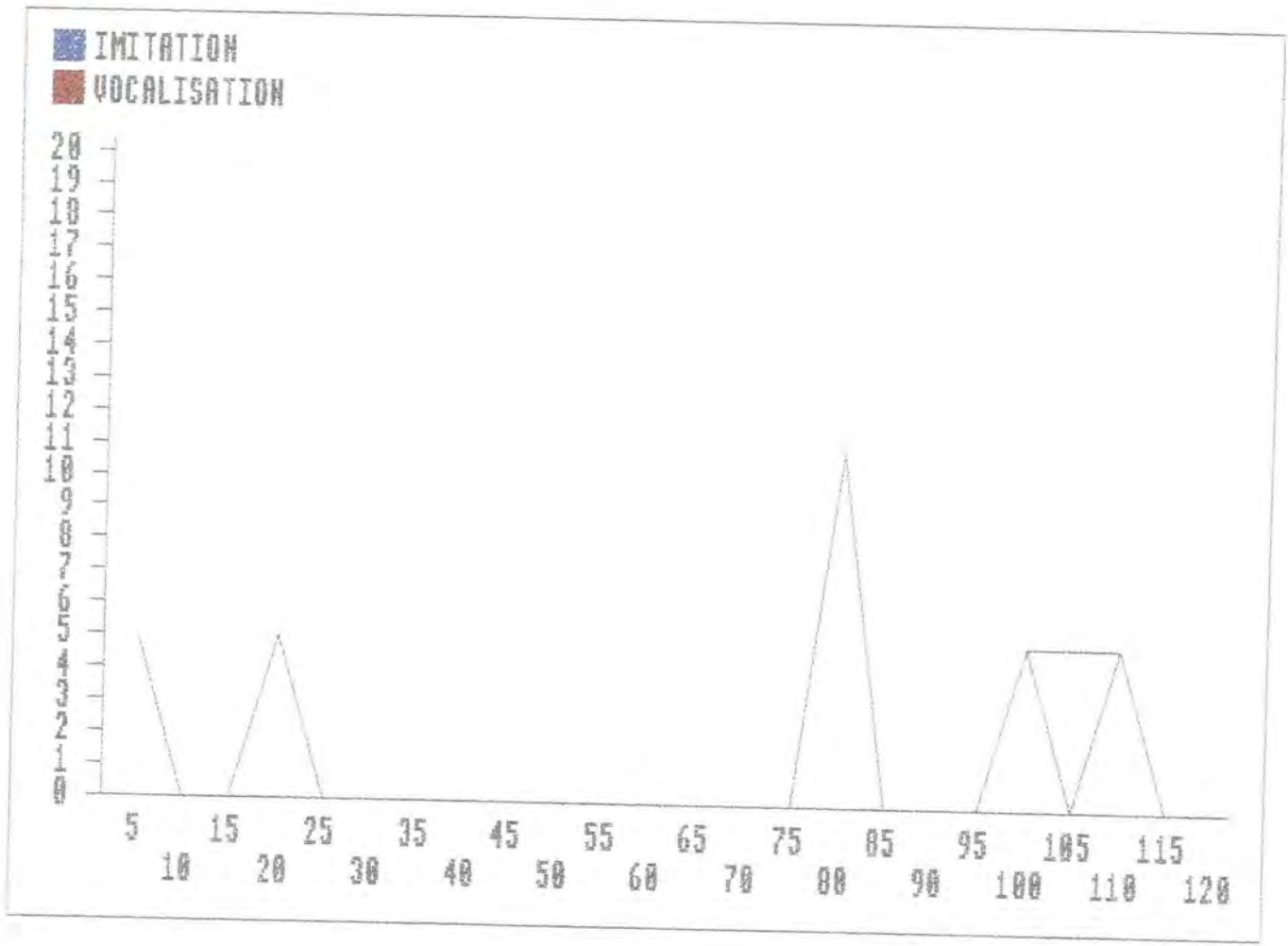
Child: JS

Appendix 12

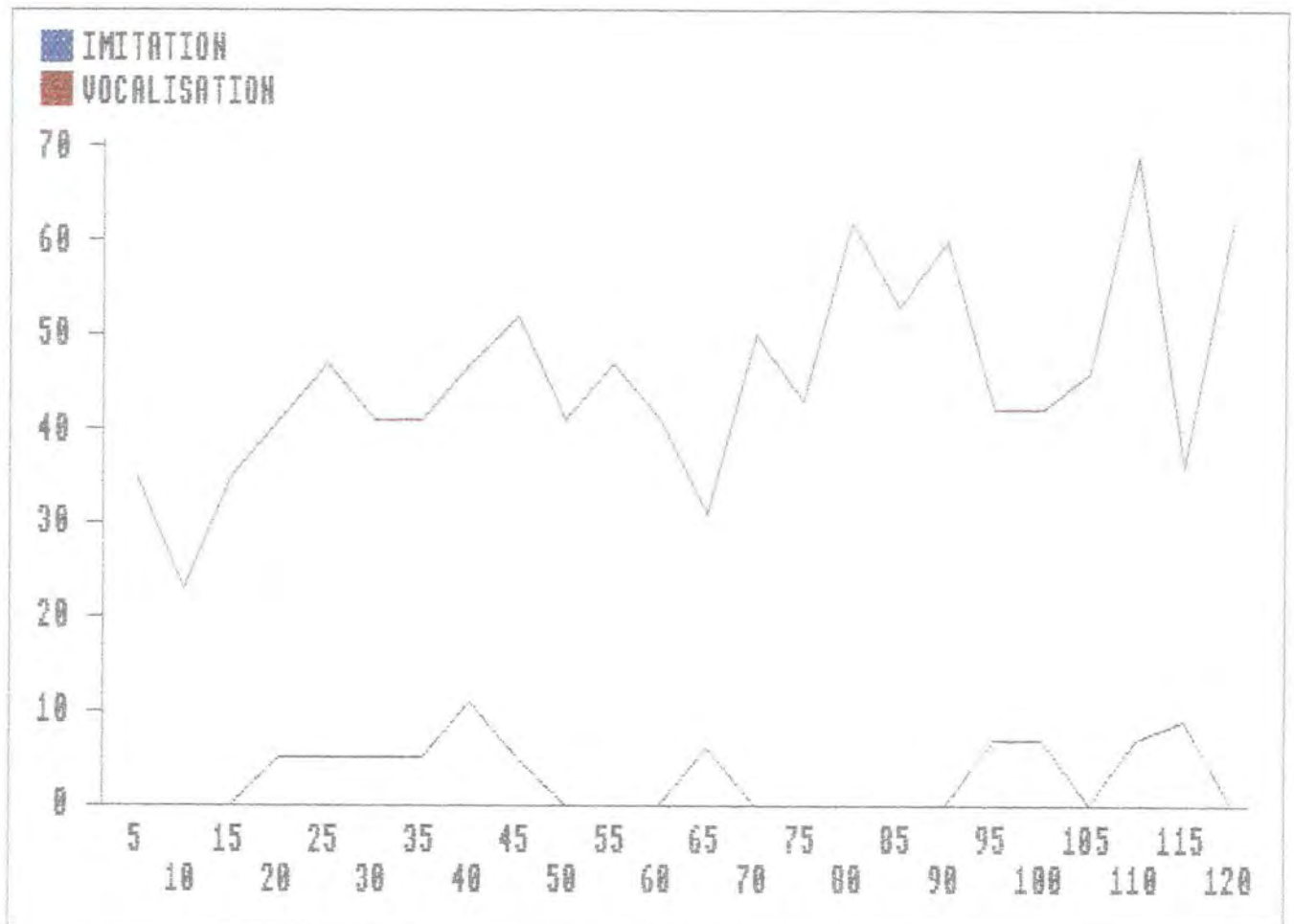
Children's vocalisation and adult imitation


IMITATION
VOCALISATION
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: JS


IMITATION
VOCALISATION
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120

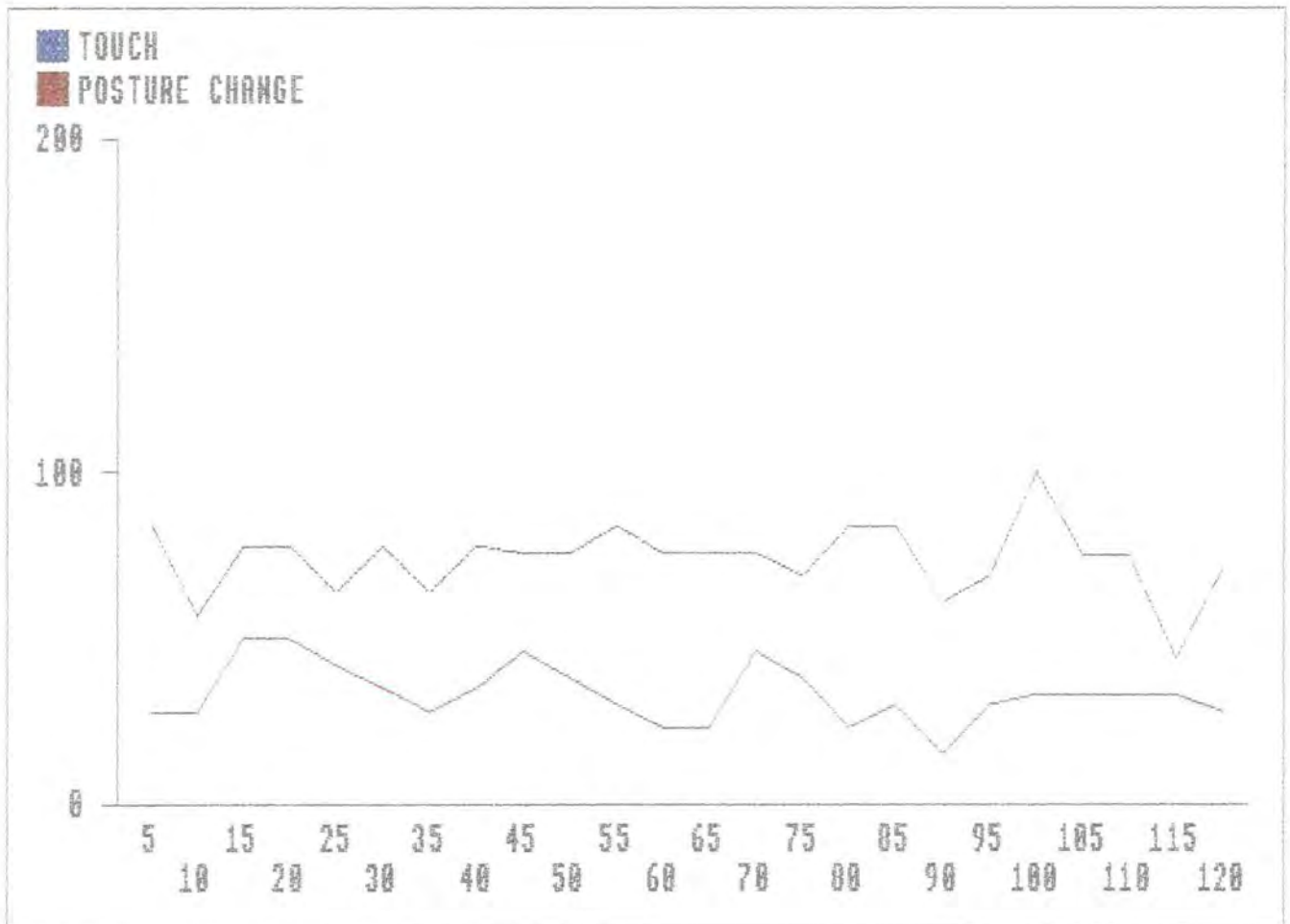
Child: DW


IMITATION
VOCALISATION
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

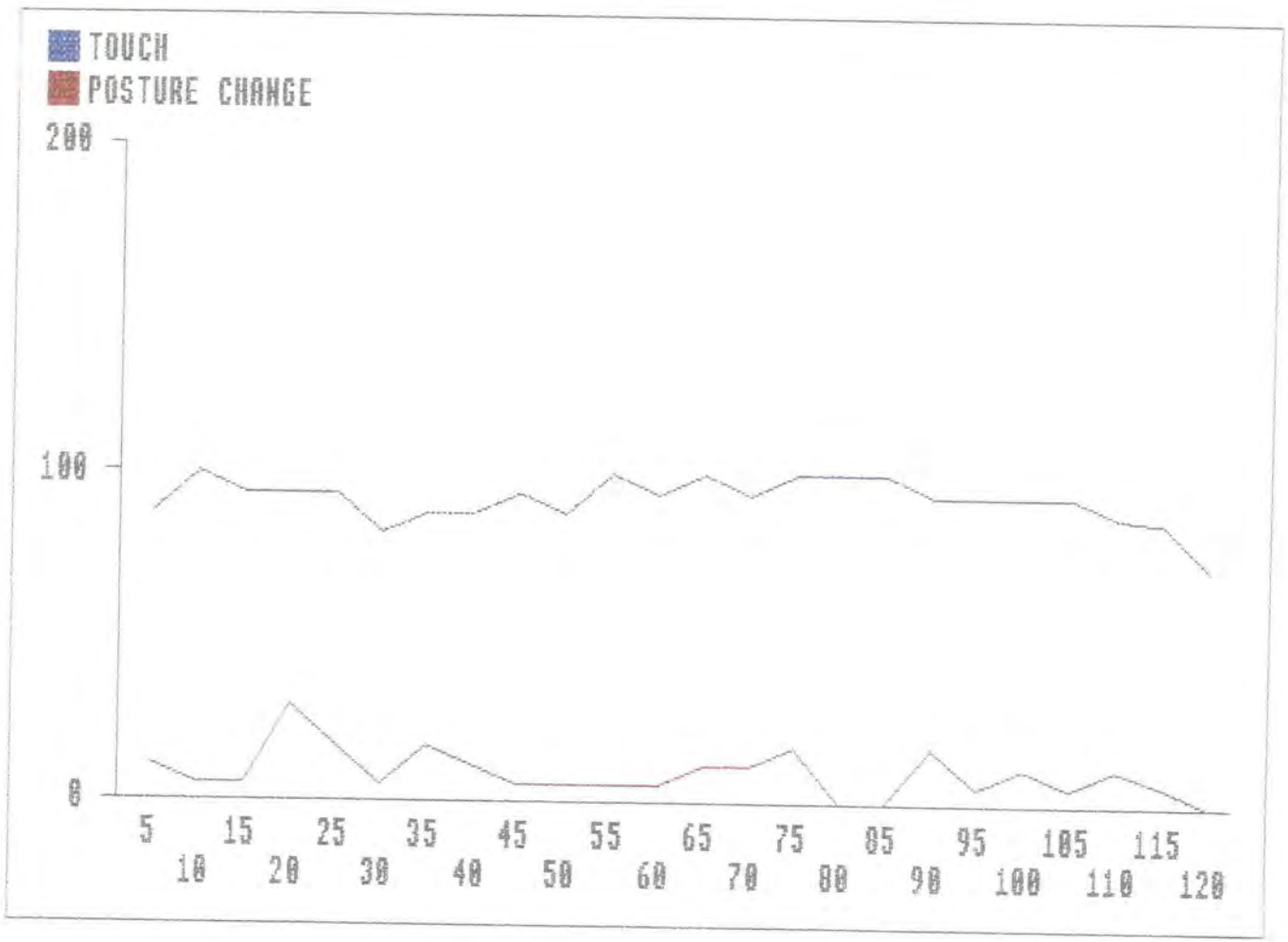
Child: MM

Appendix 13

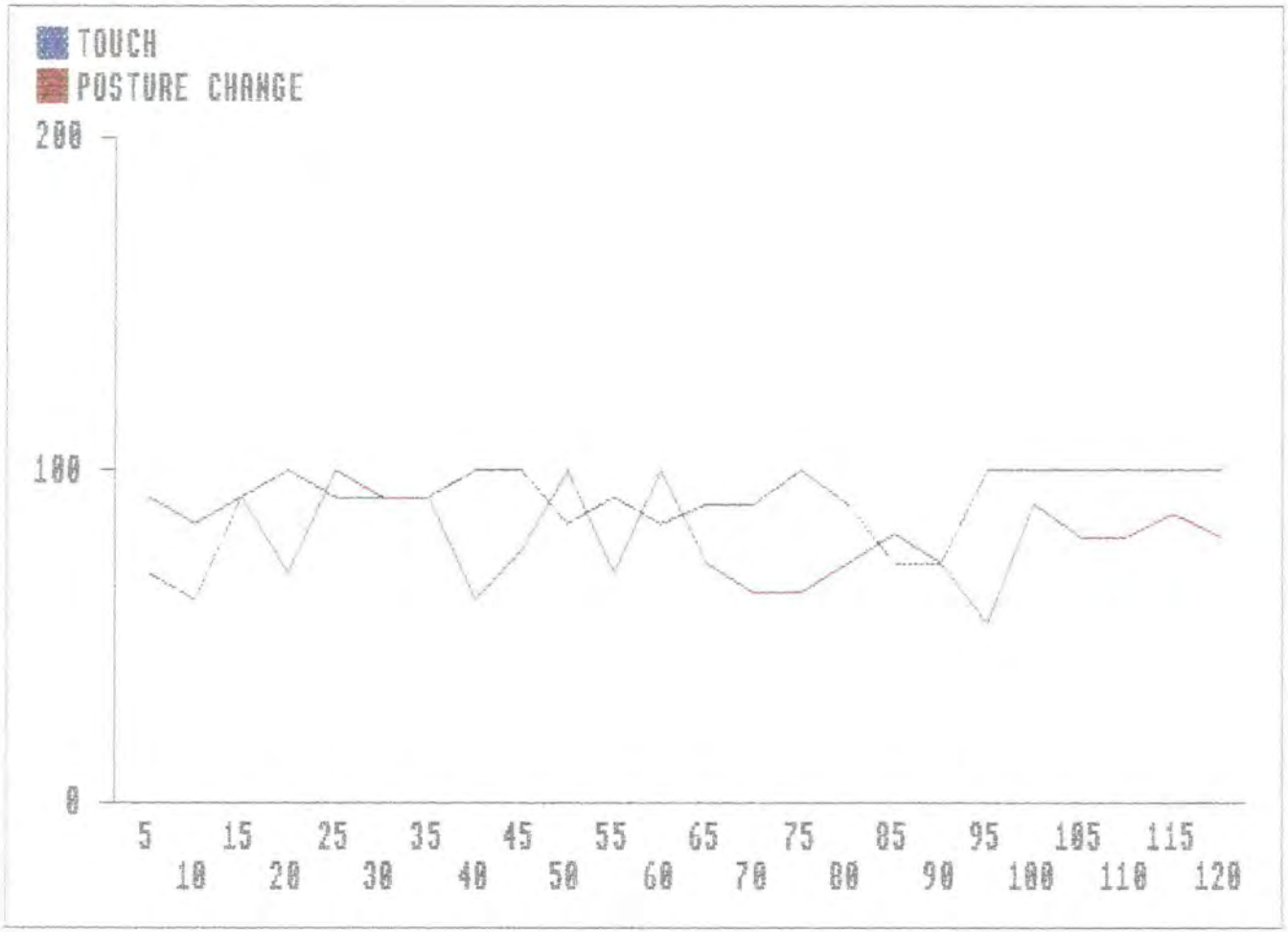
Children's posture change and adult touch


TOUCH
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

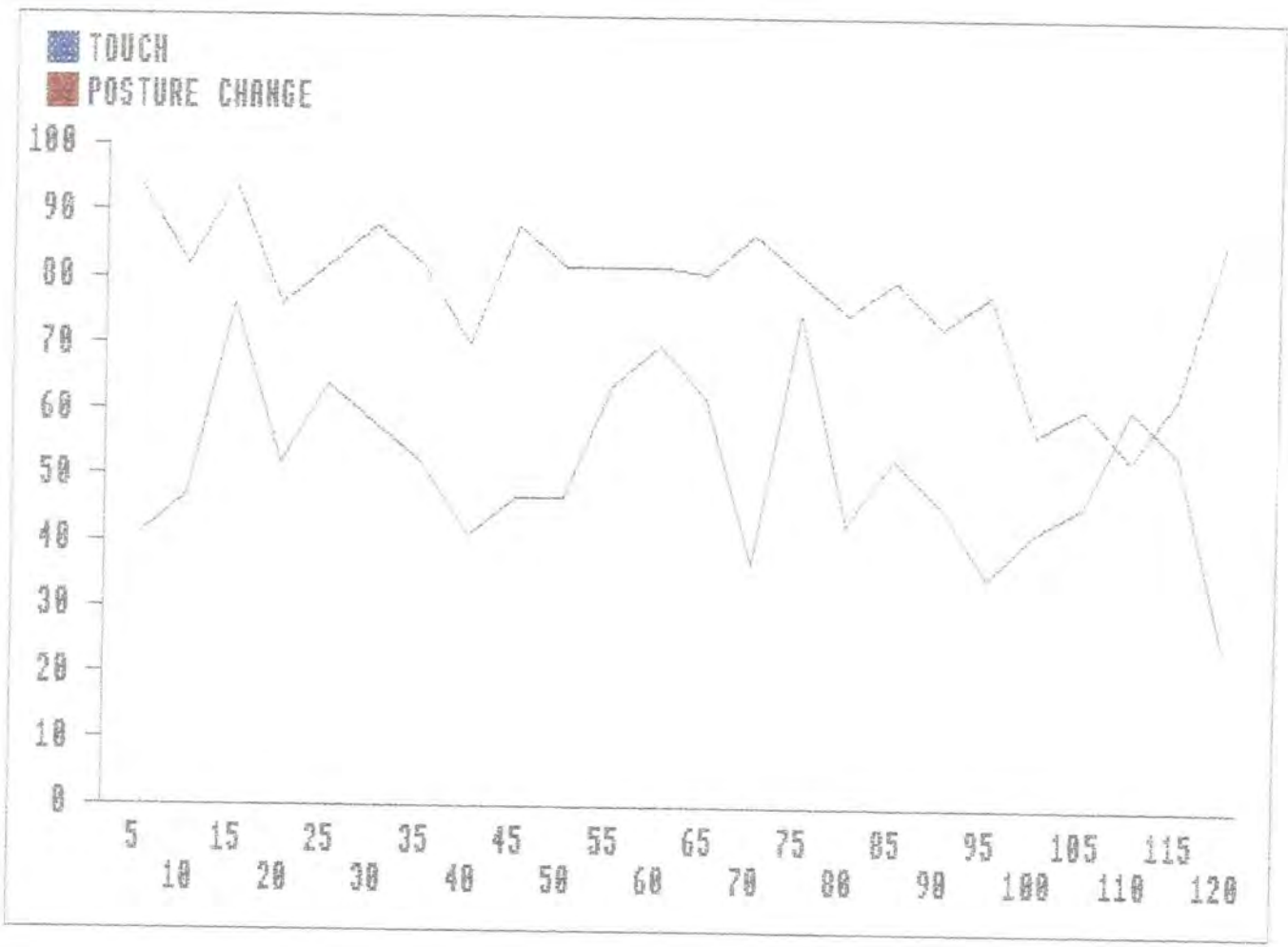
Child: AP


TOUCH
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


TOUCH
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

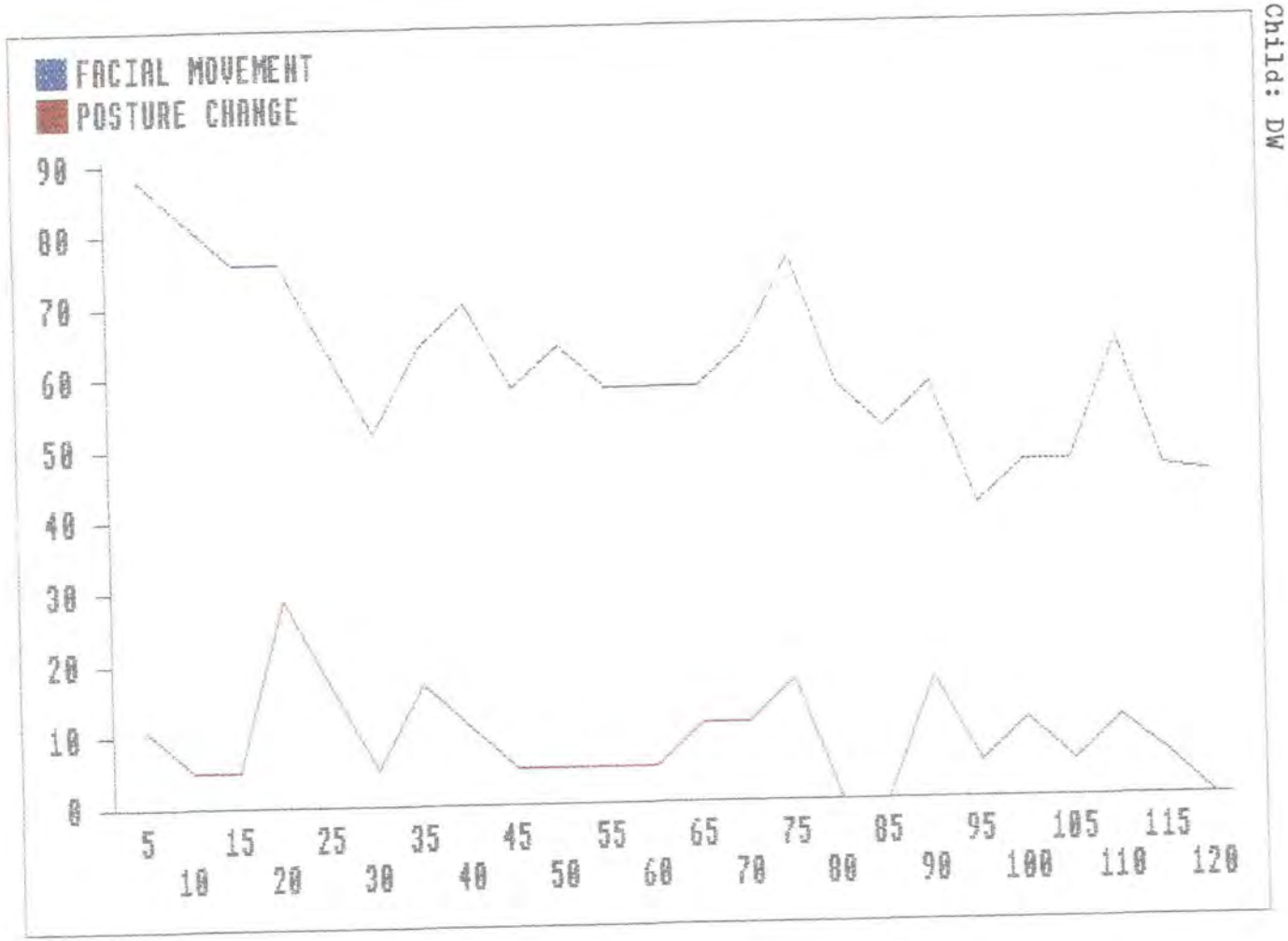
Child: JS


TOUCH
POSTURE CHANGE
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

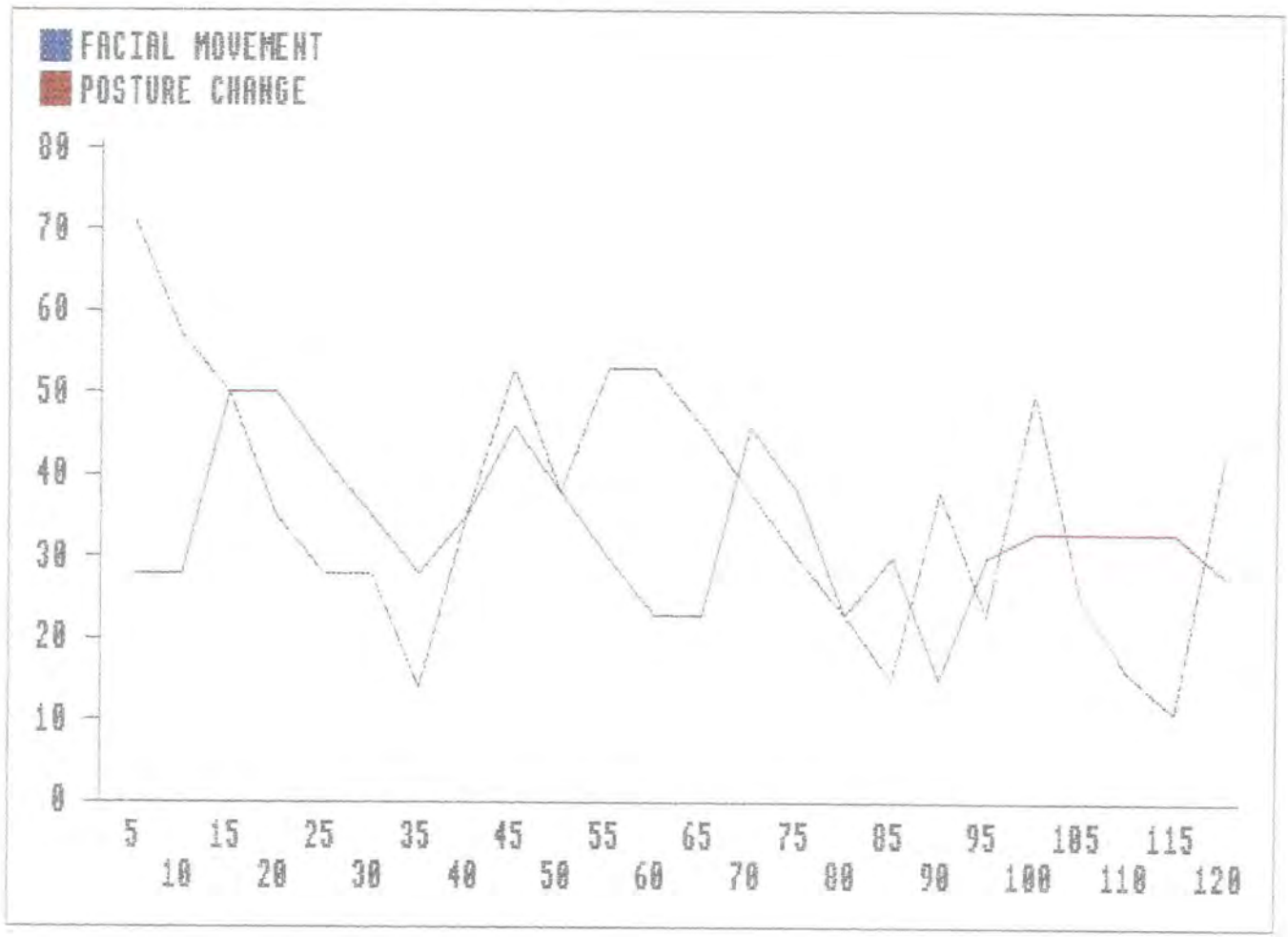
Child: MM

Appendix 14

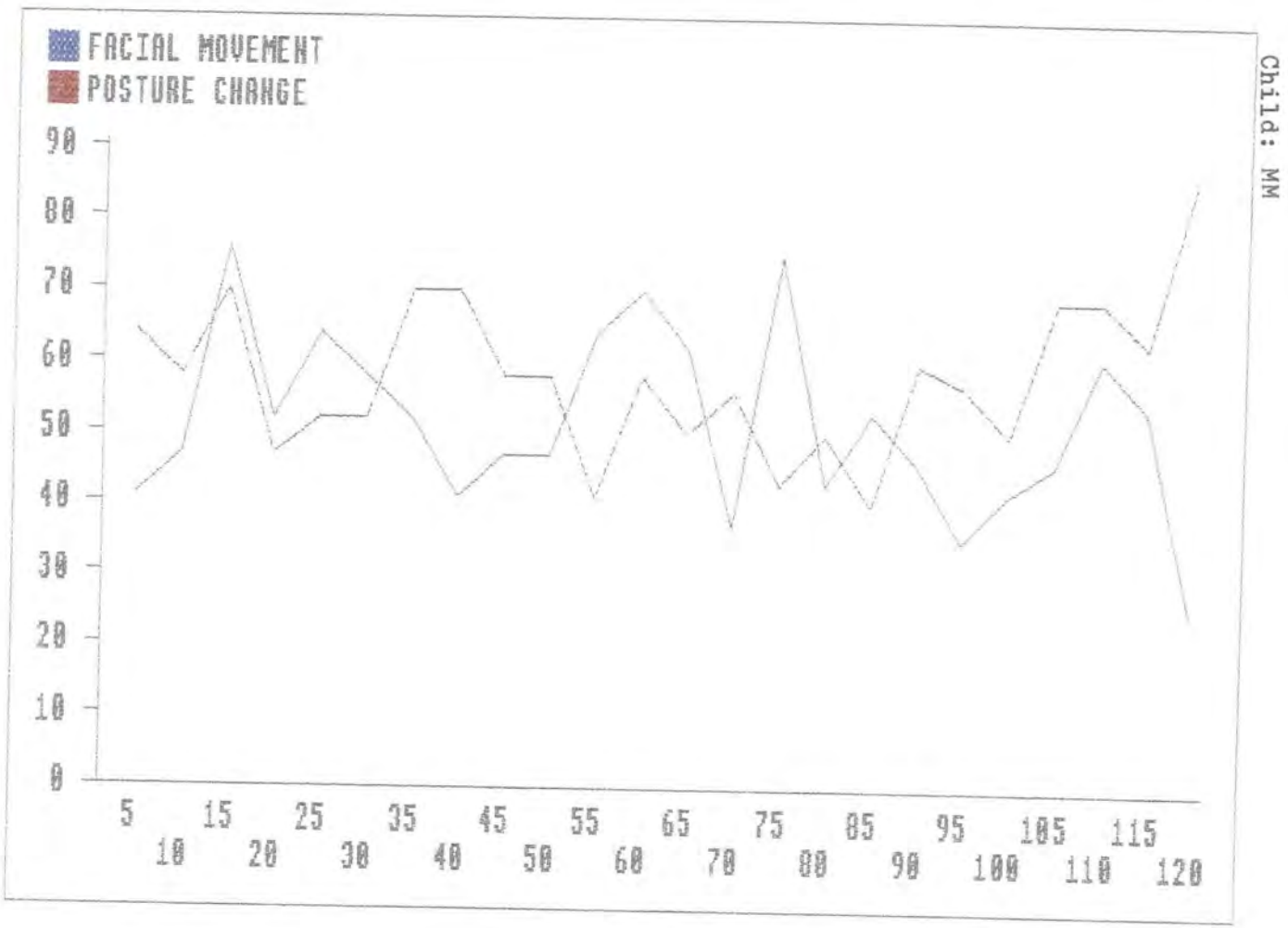
Children's posture change and adult facial movements

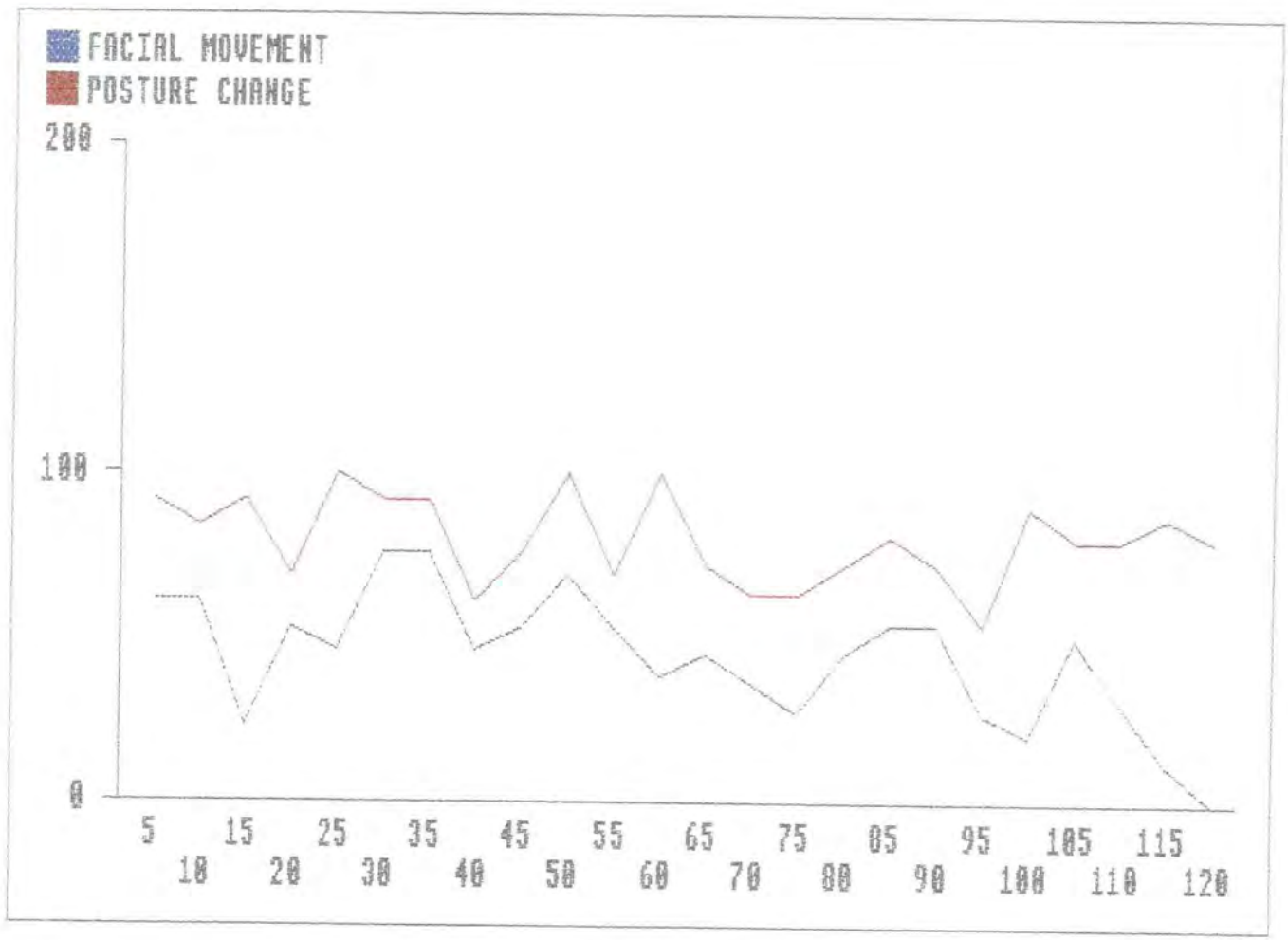

FACIAL MOVEMENT
POSTURE CHANGE
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


FACIAL MOVEMENT
POSTURE CHANGE
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: AP

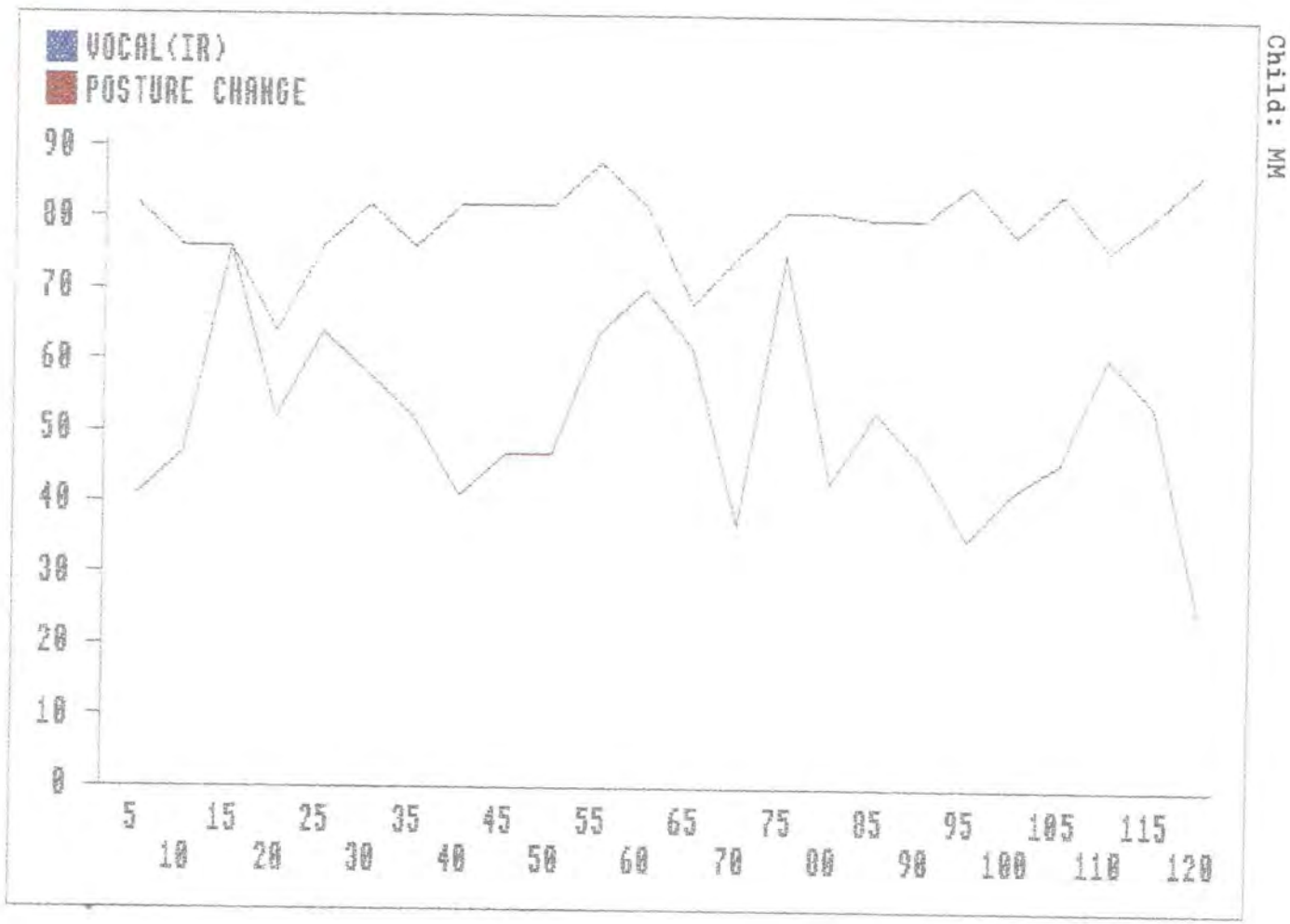

FACIAL MOVEMENT
POSTURE CHANGE
90
80
70
60
50
40
30
20
10
0
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120
Child: MM


FACIAL MOVEMENT
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

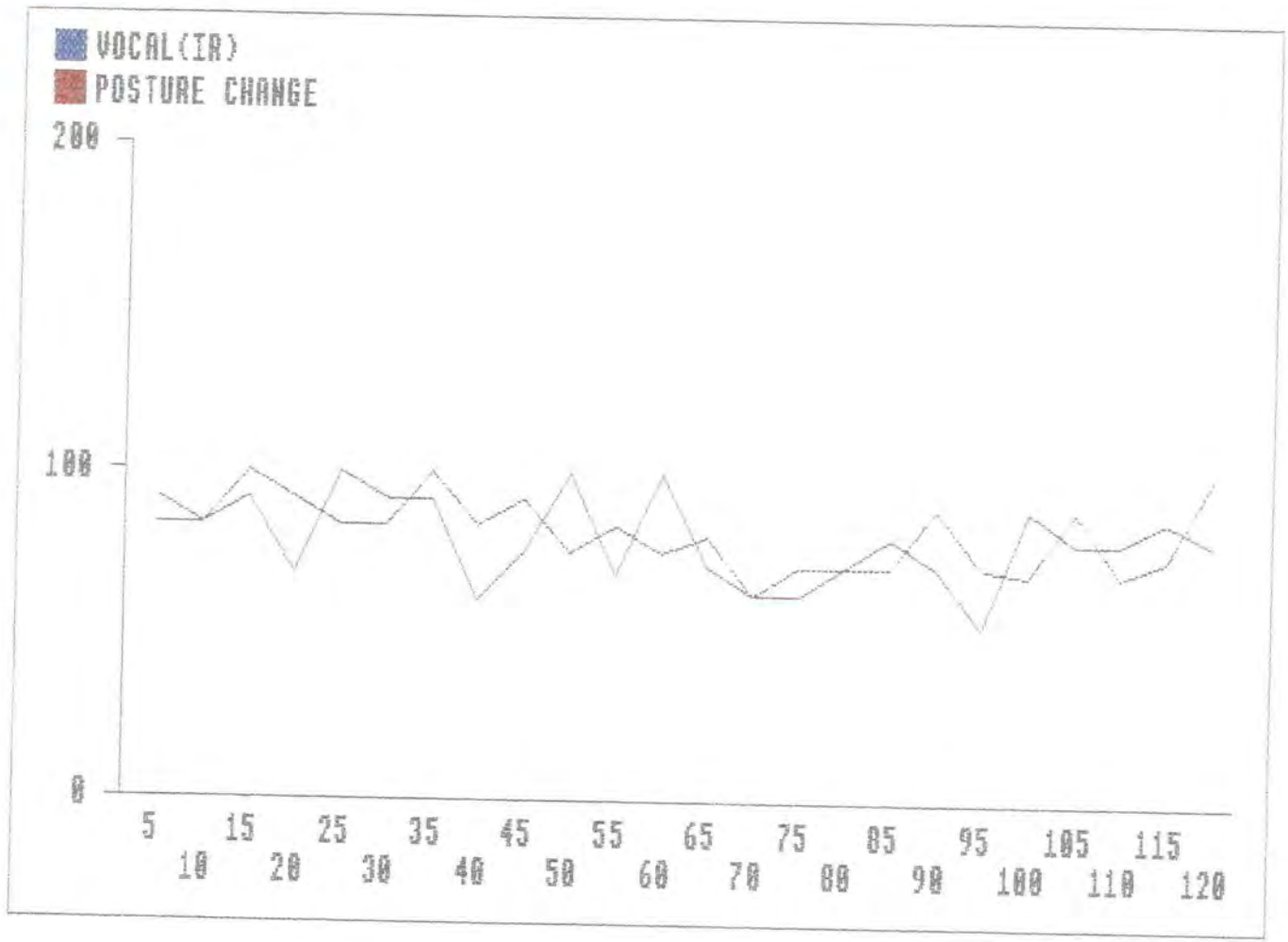
Child: JS

Appendix 15

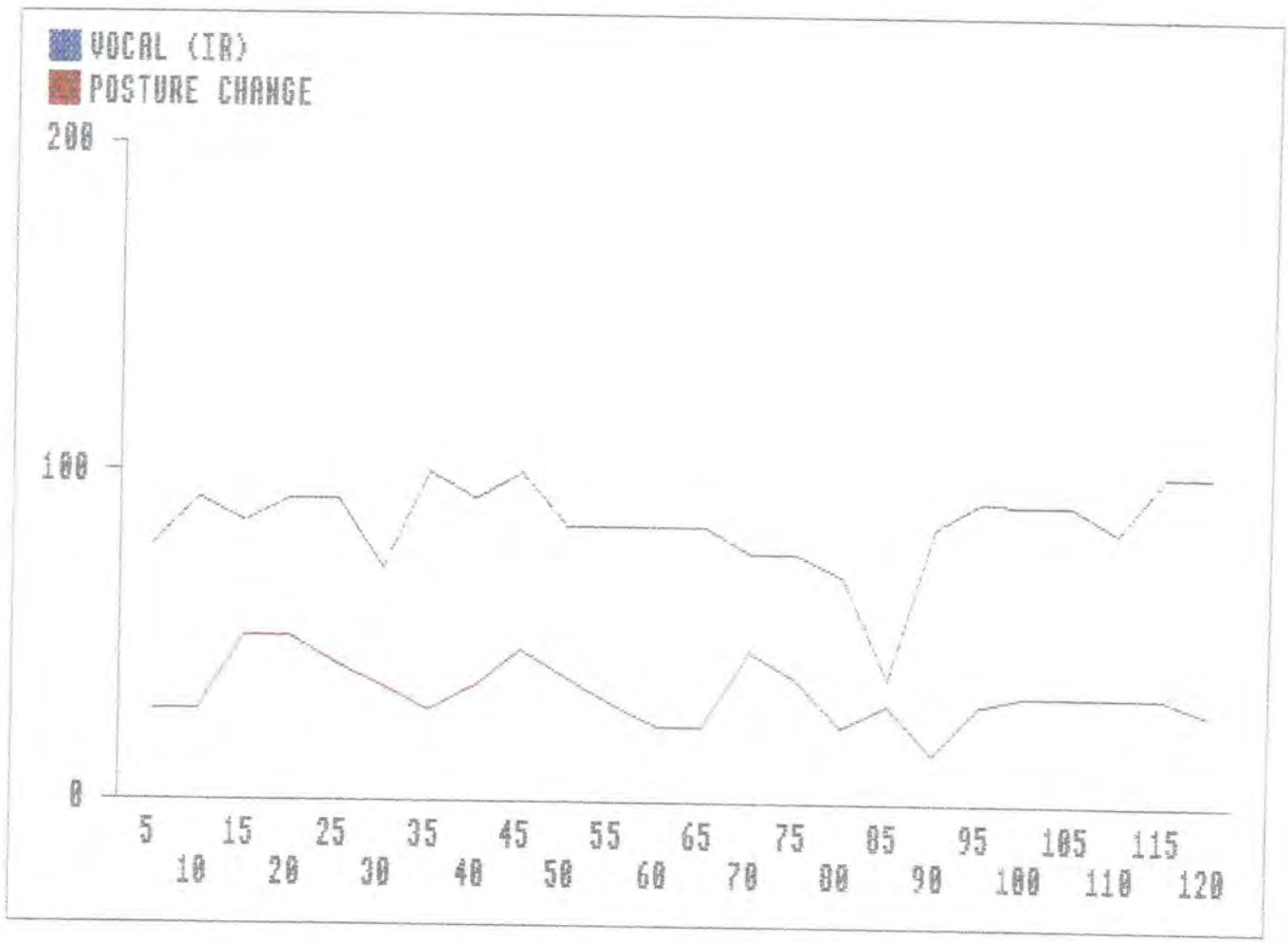
Children's posture change and adult vocalisation


VOCAL(IR)
POSTURE CHANGE
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

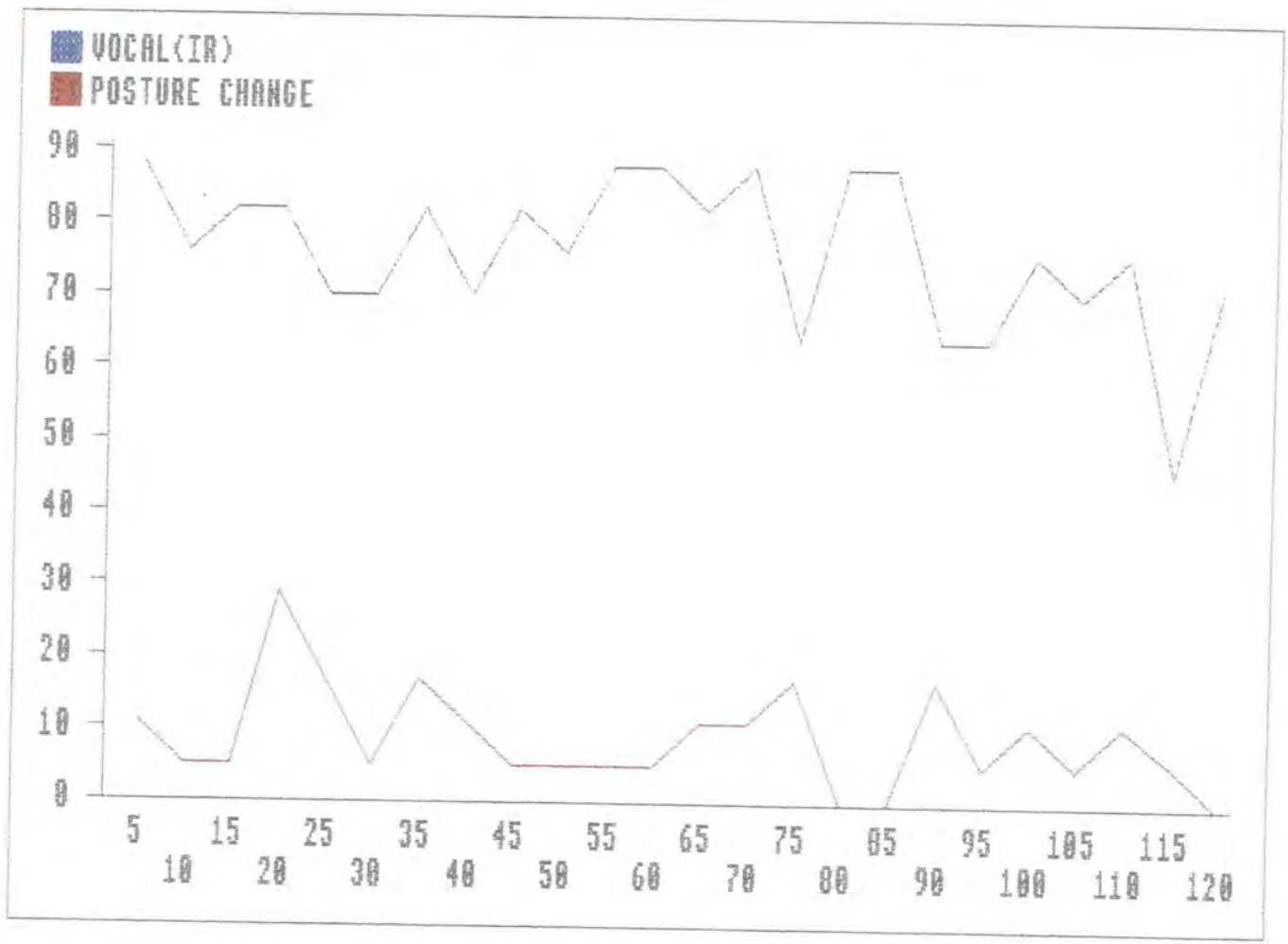
Child: MM


VOCAL(IR)
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: JS


VOCAL (IR)
POSTURE CHANGE
200
100
0
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120

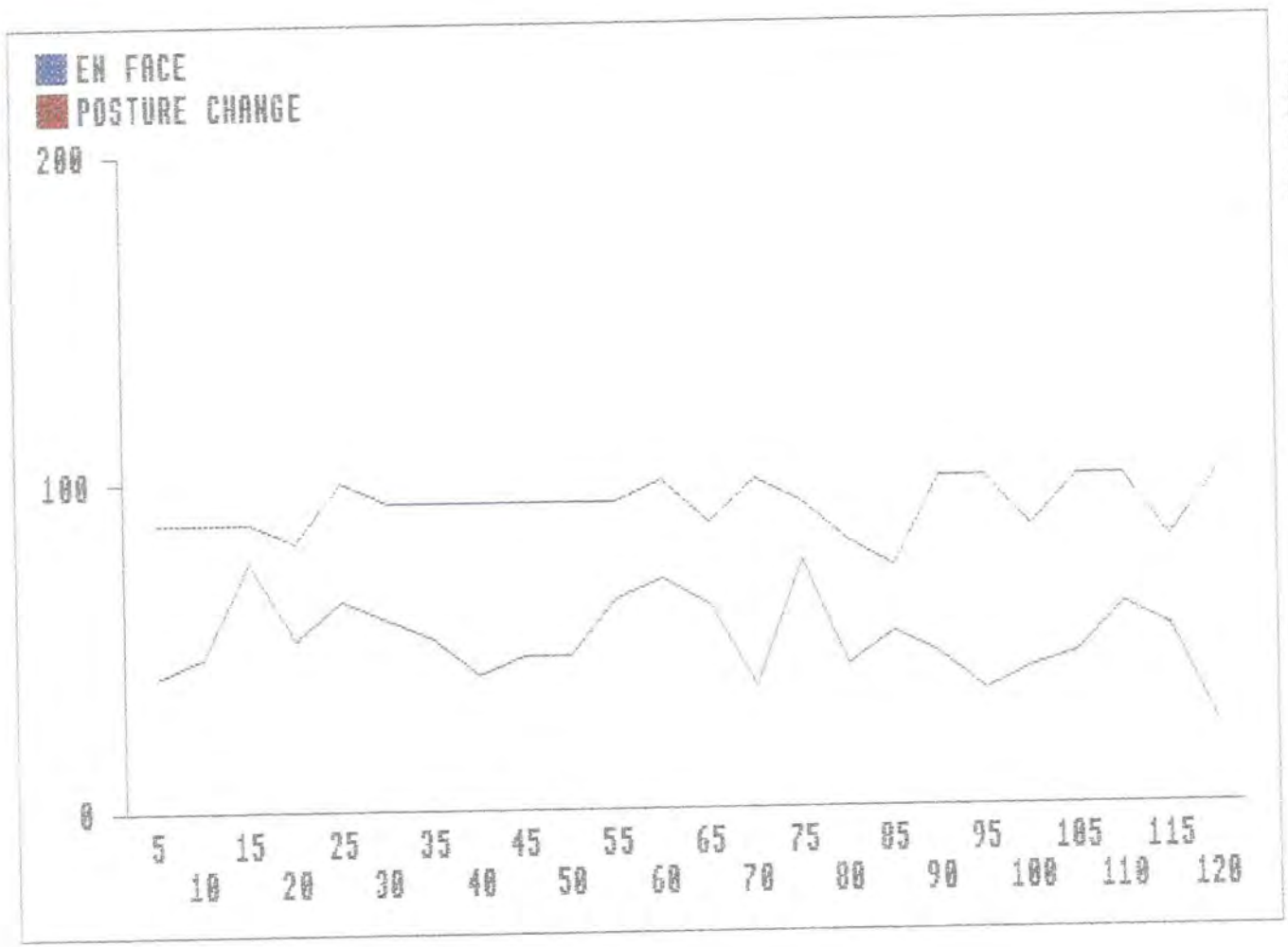
Child: AP


VOCAL(IR)
POSTURE CHANGE
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

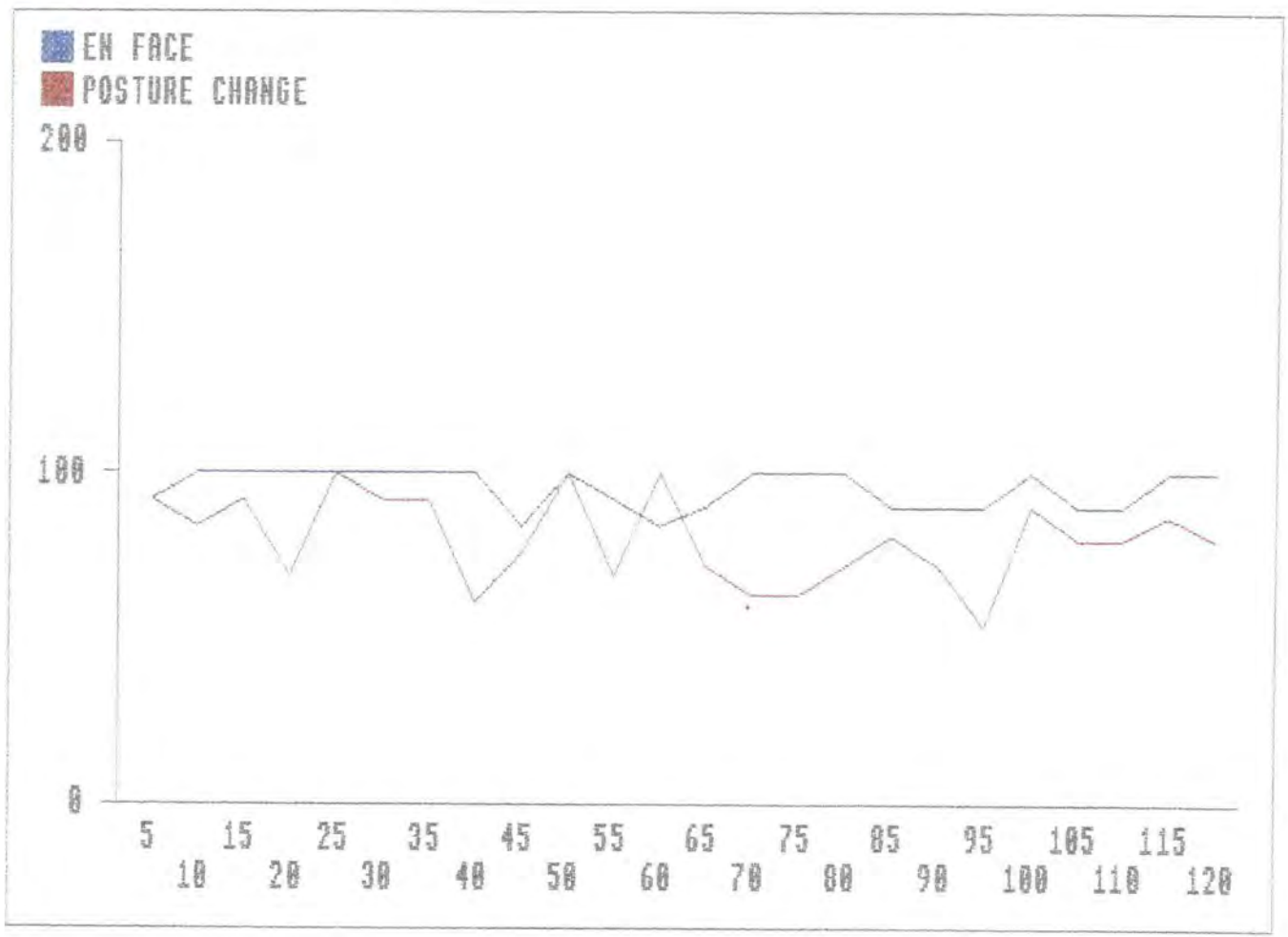
Child: DW

Appendix 16

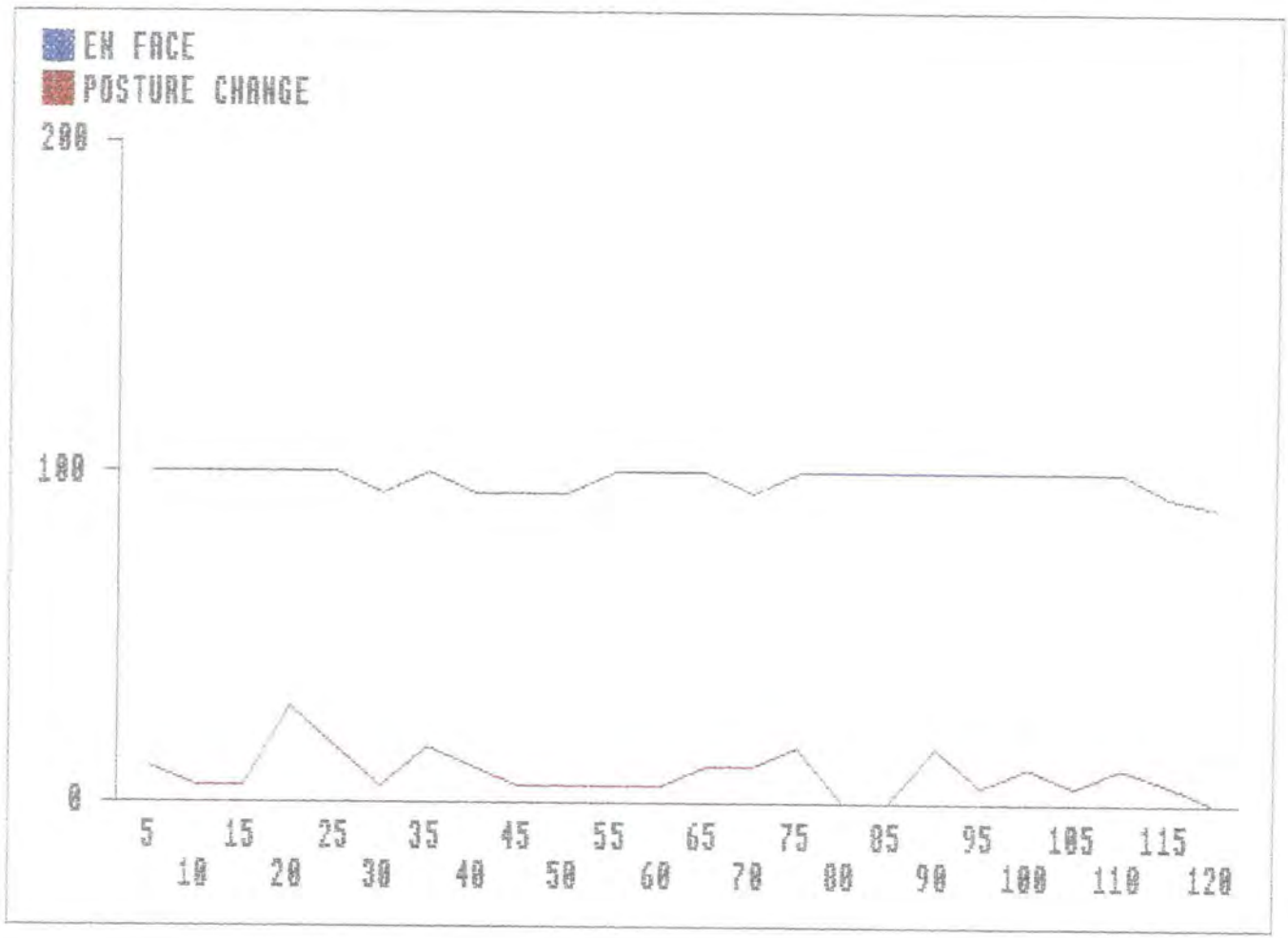
Children's posture change and adult en face behaviour


EN FACE
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

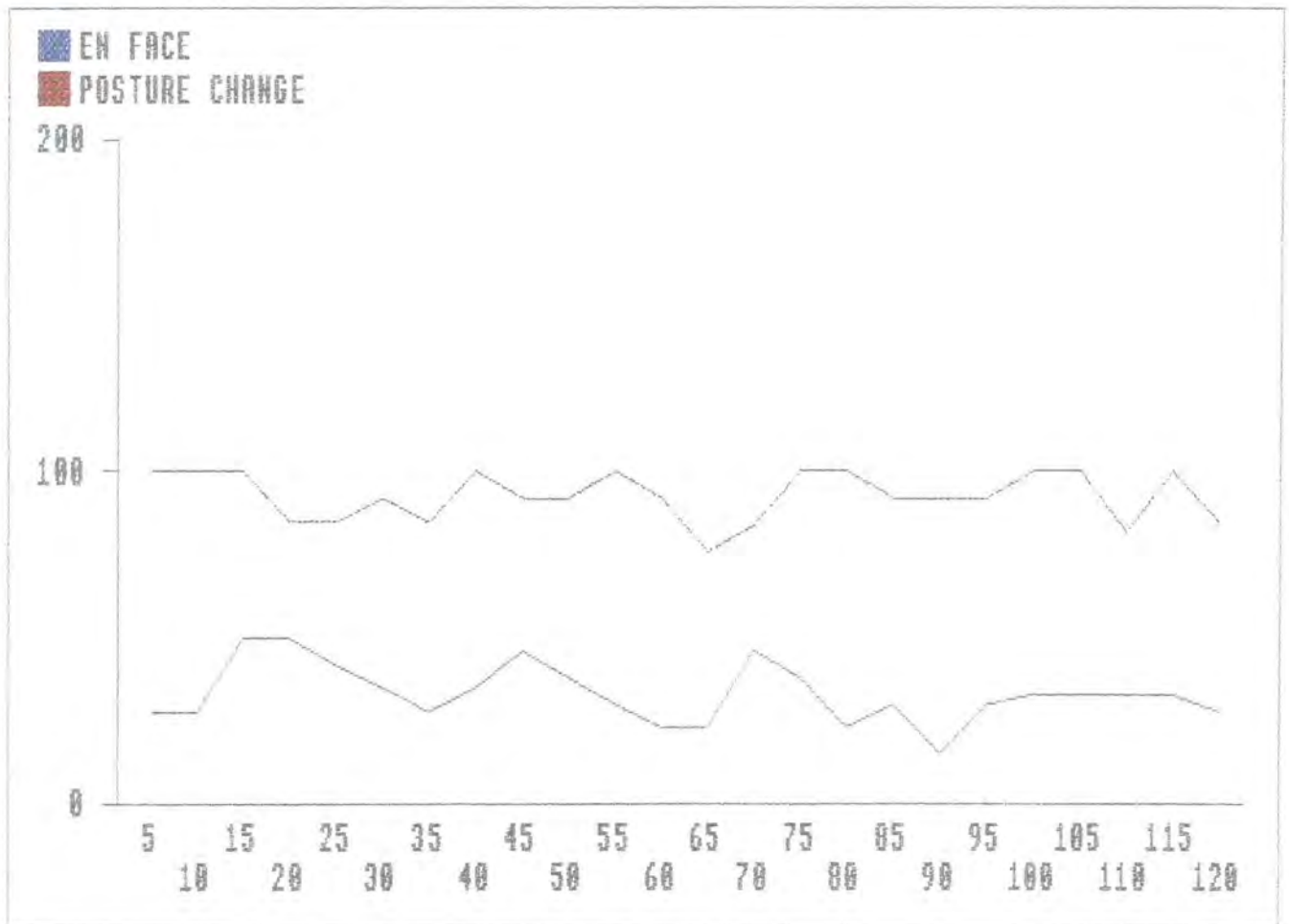
Child: MM


EN FACE
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: JS


EN FACE
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

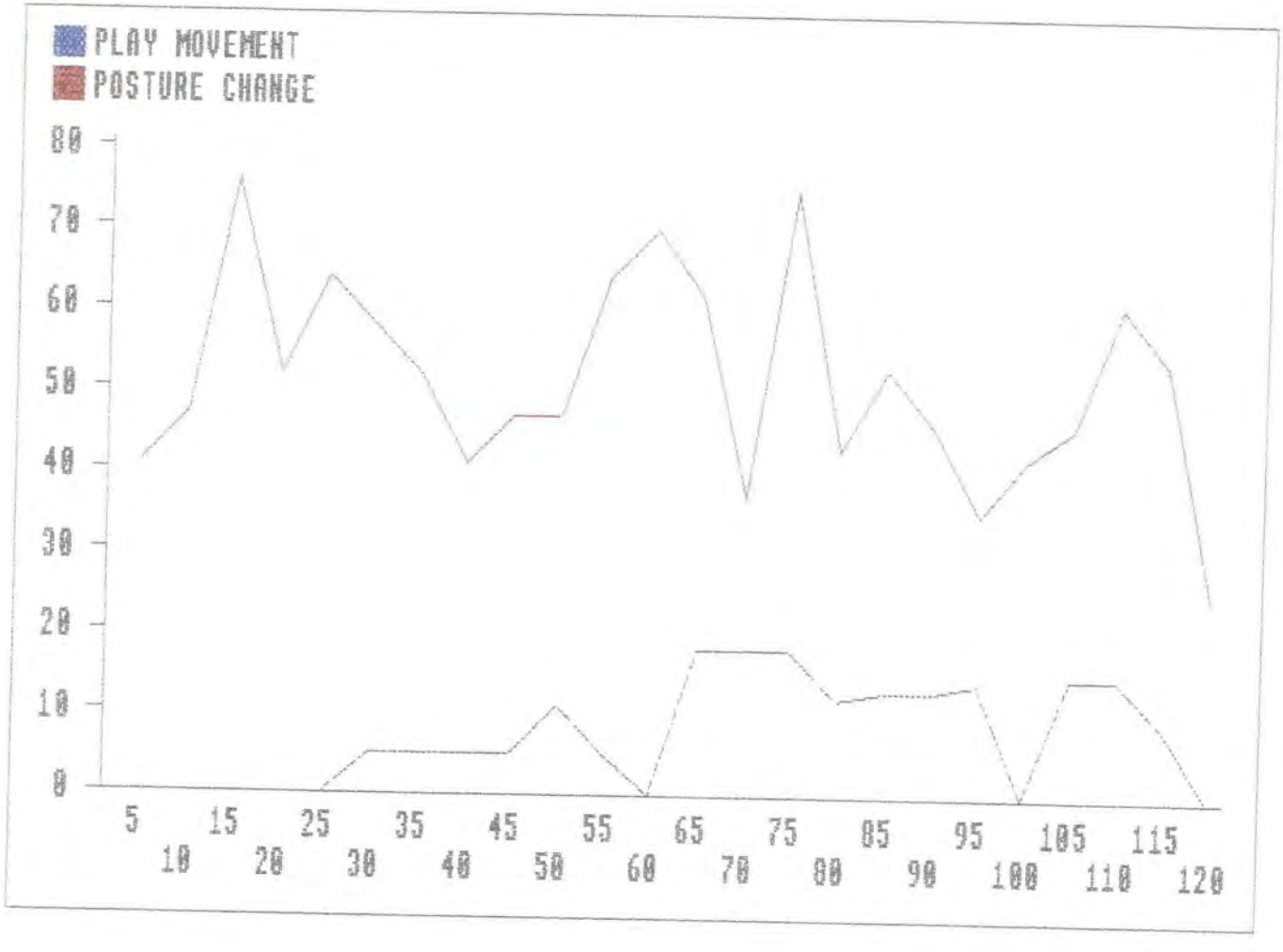
Child: DW


EN FACE
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

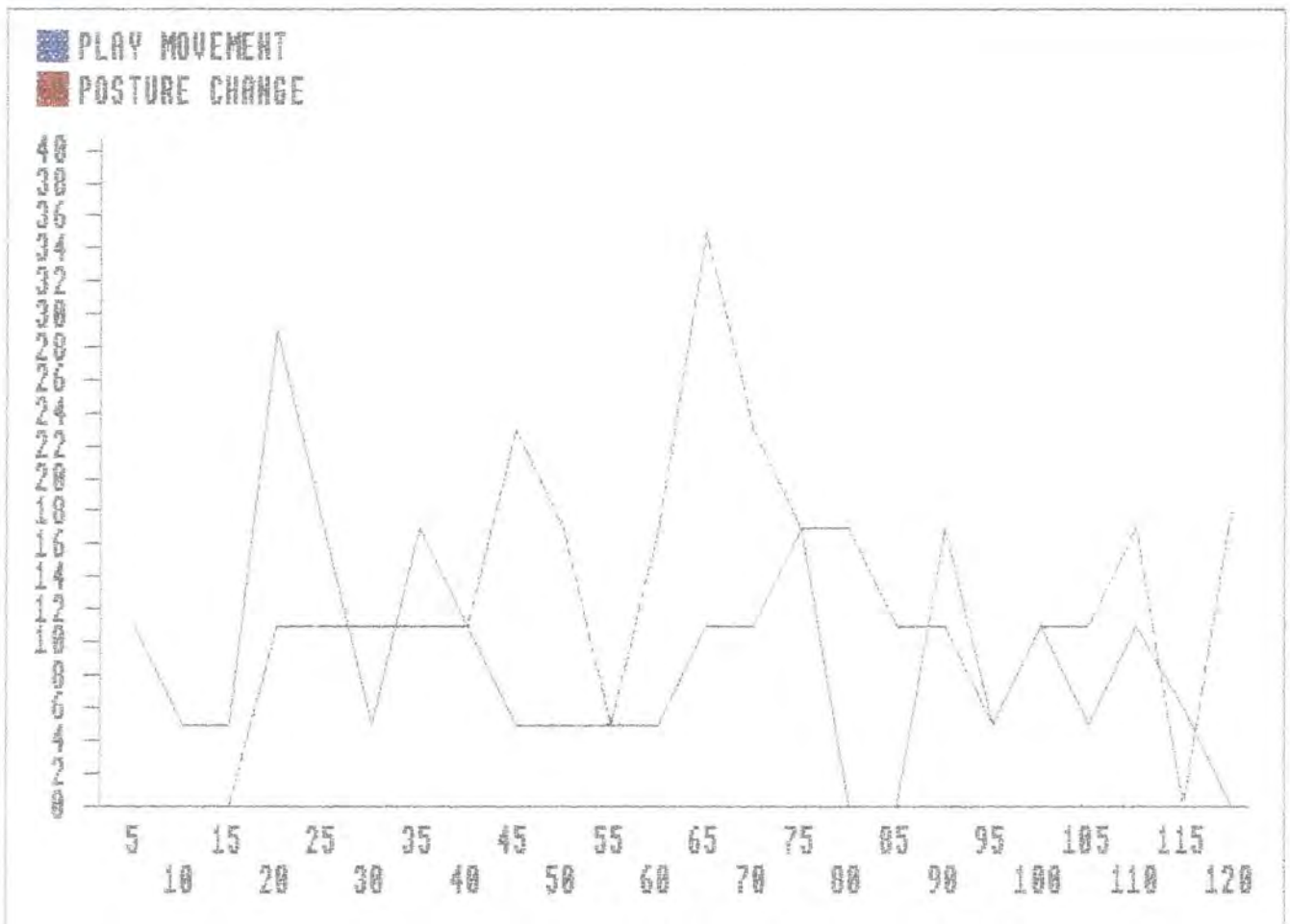
Child: AP

Appendix 17

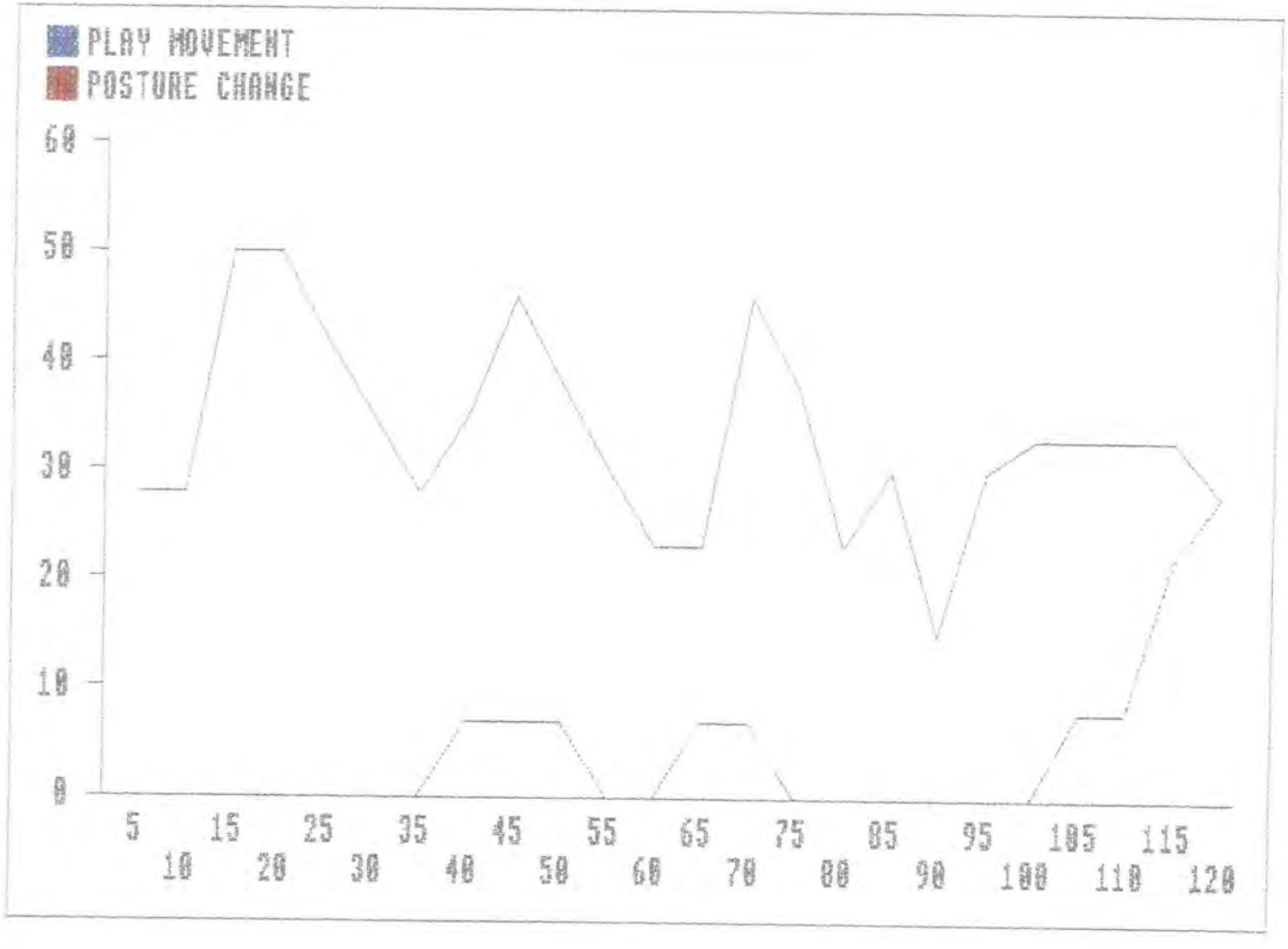
Children's posture change and adult play movements


PLAY MOVEMENT
POSTURE CHANGE
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

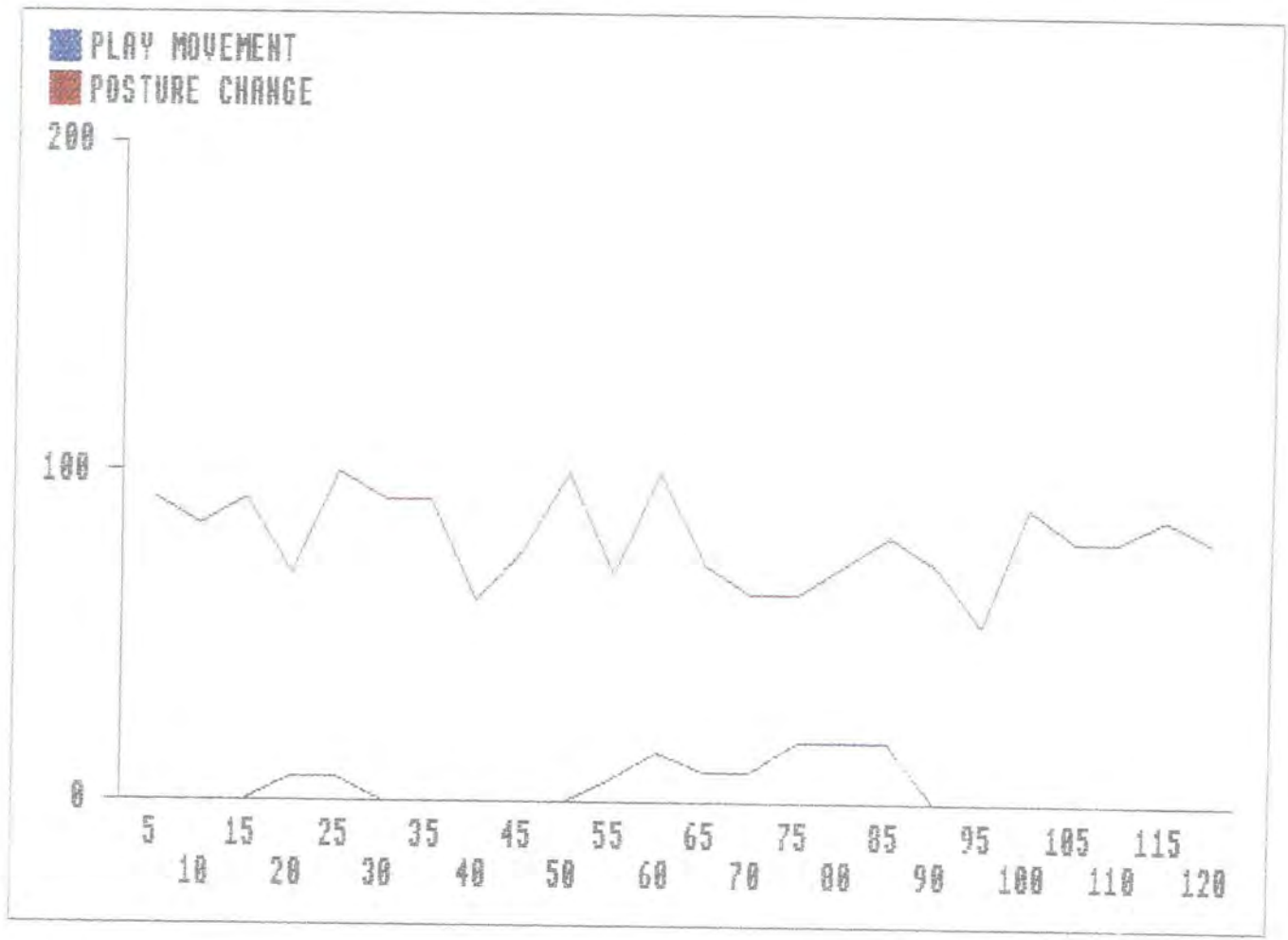
Child: MM


PLAY MOVEMENT
POSTURE CHANGE
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


PLAY MOVEMENT
POSTURE CHANGE
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

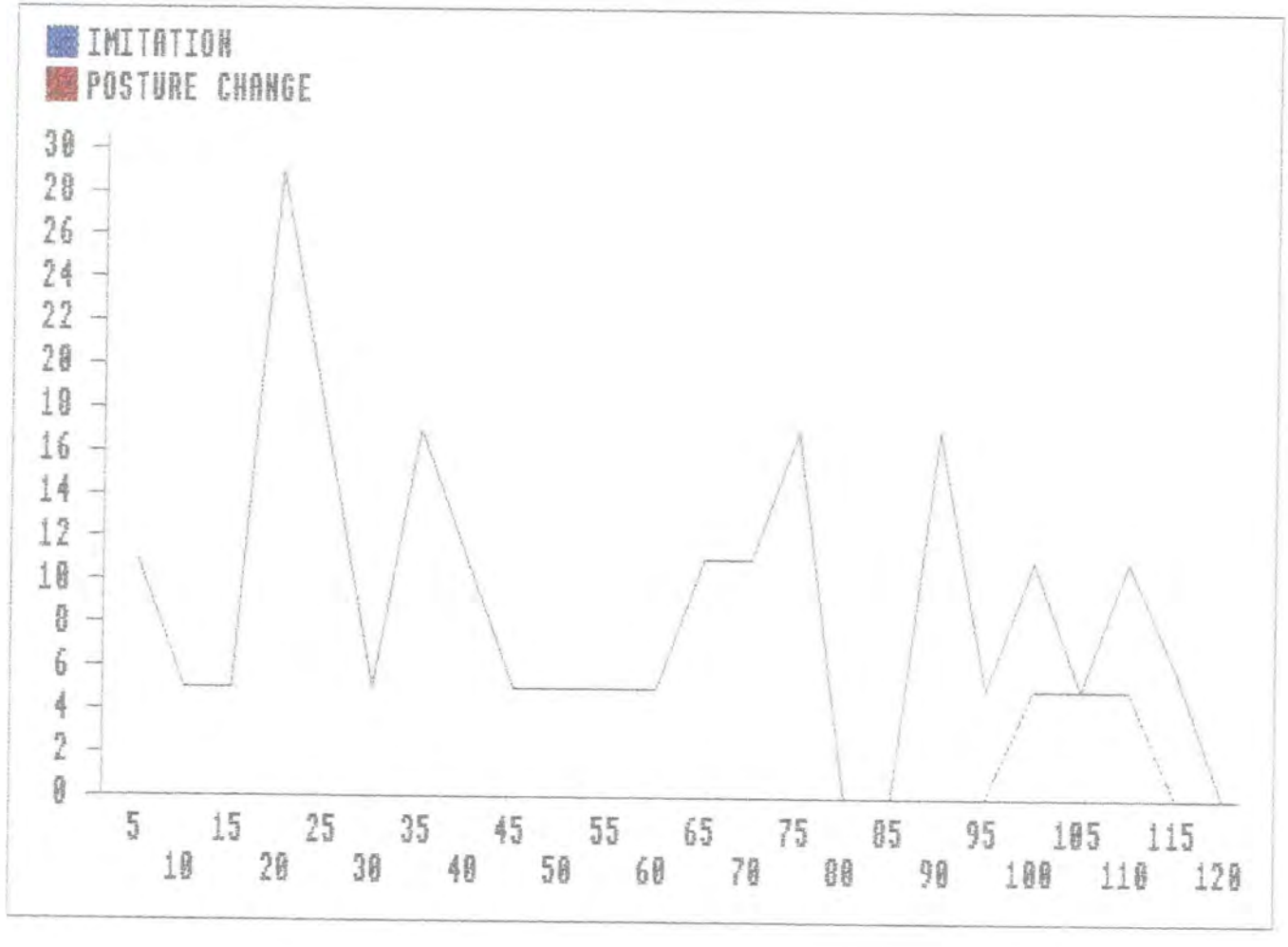
Child: AP


PLAY MOVEMENT
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

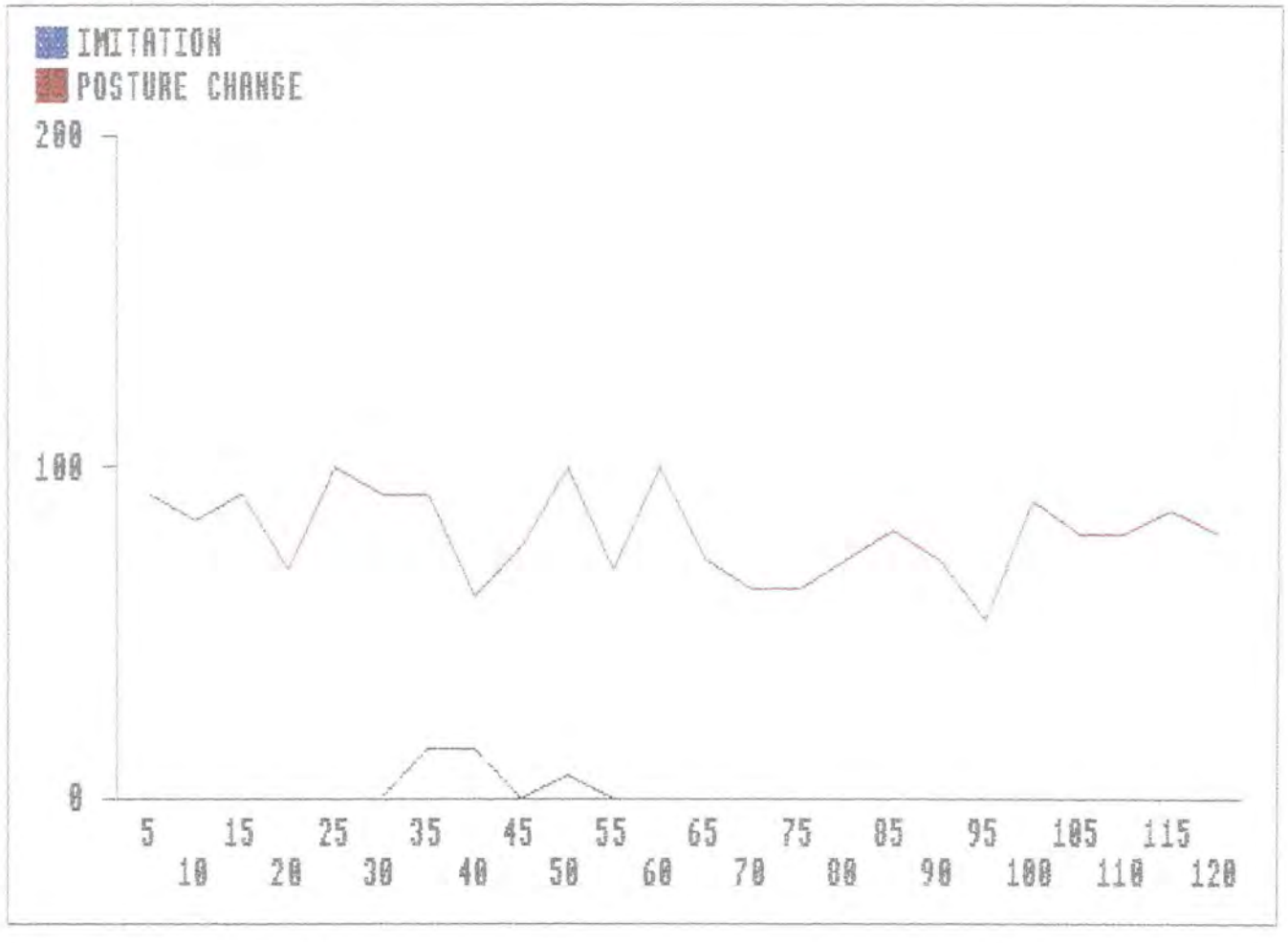
Child: JS

Appendix 18

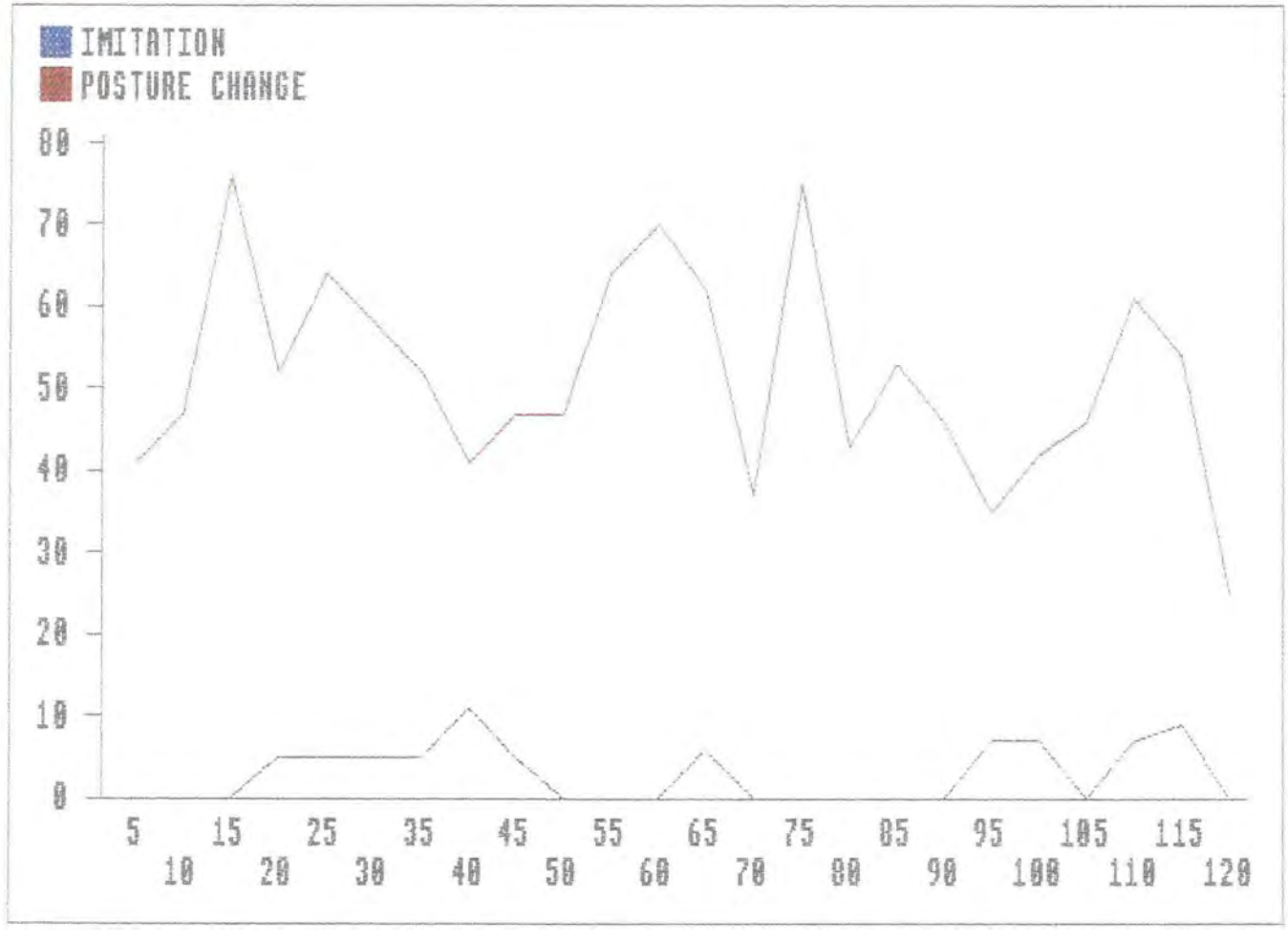
Children's posture change and adult imitation


IMITATION
POSTURE CHANGE
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


IMITATION
POSTURE CHANGE
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

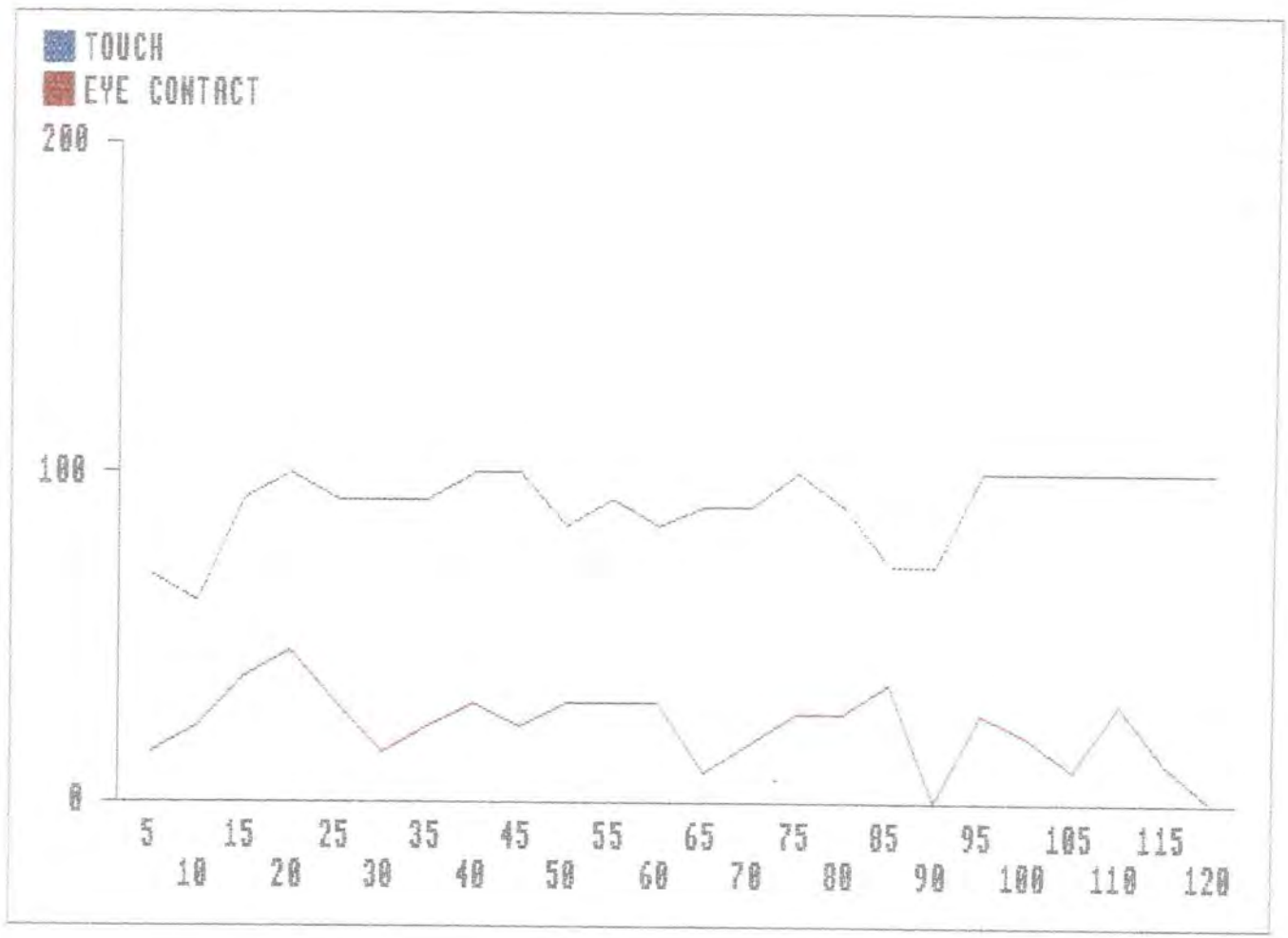
Child: JS


IMITATION
POSTURE CHANGE
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

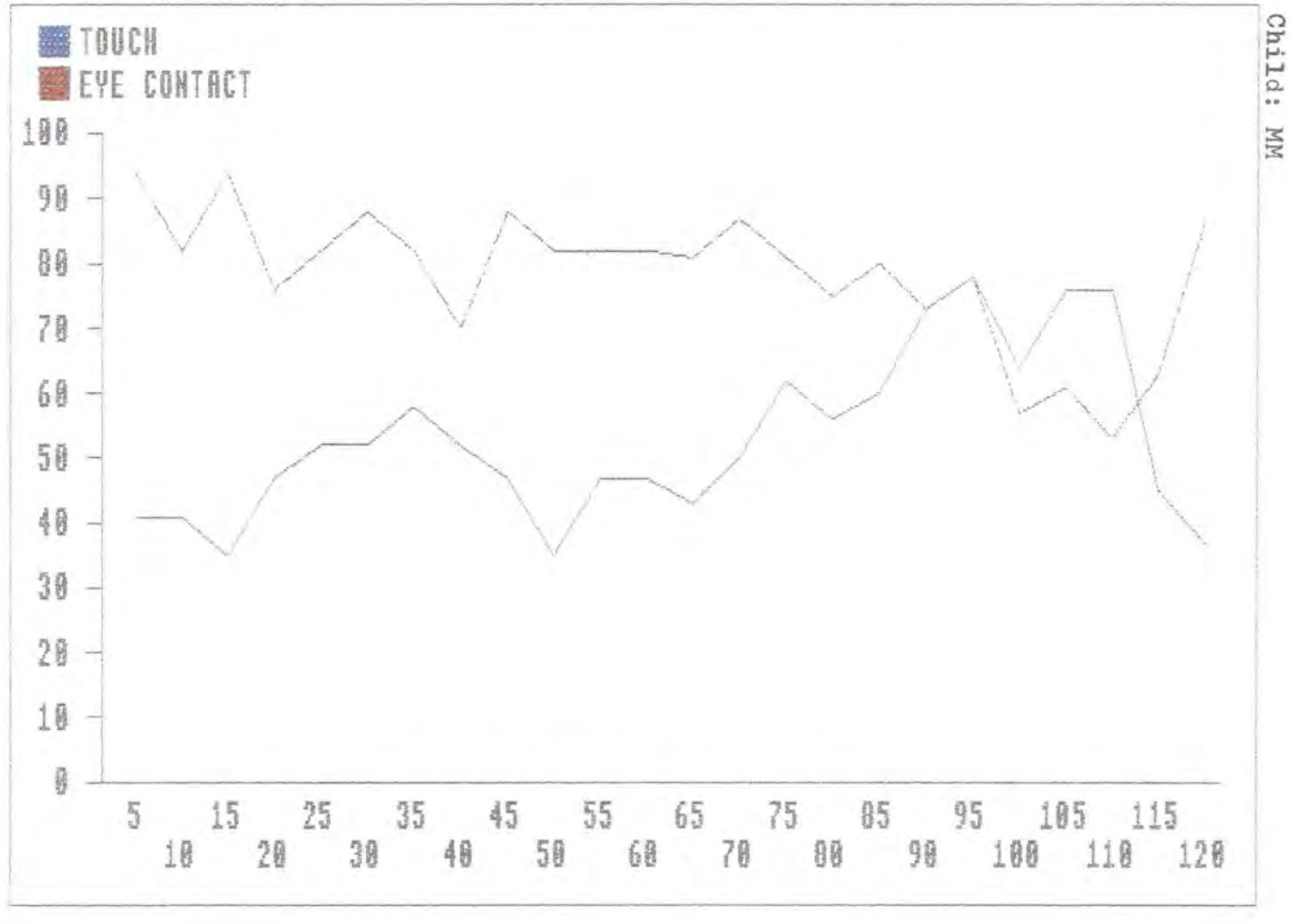
Child: MM

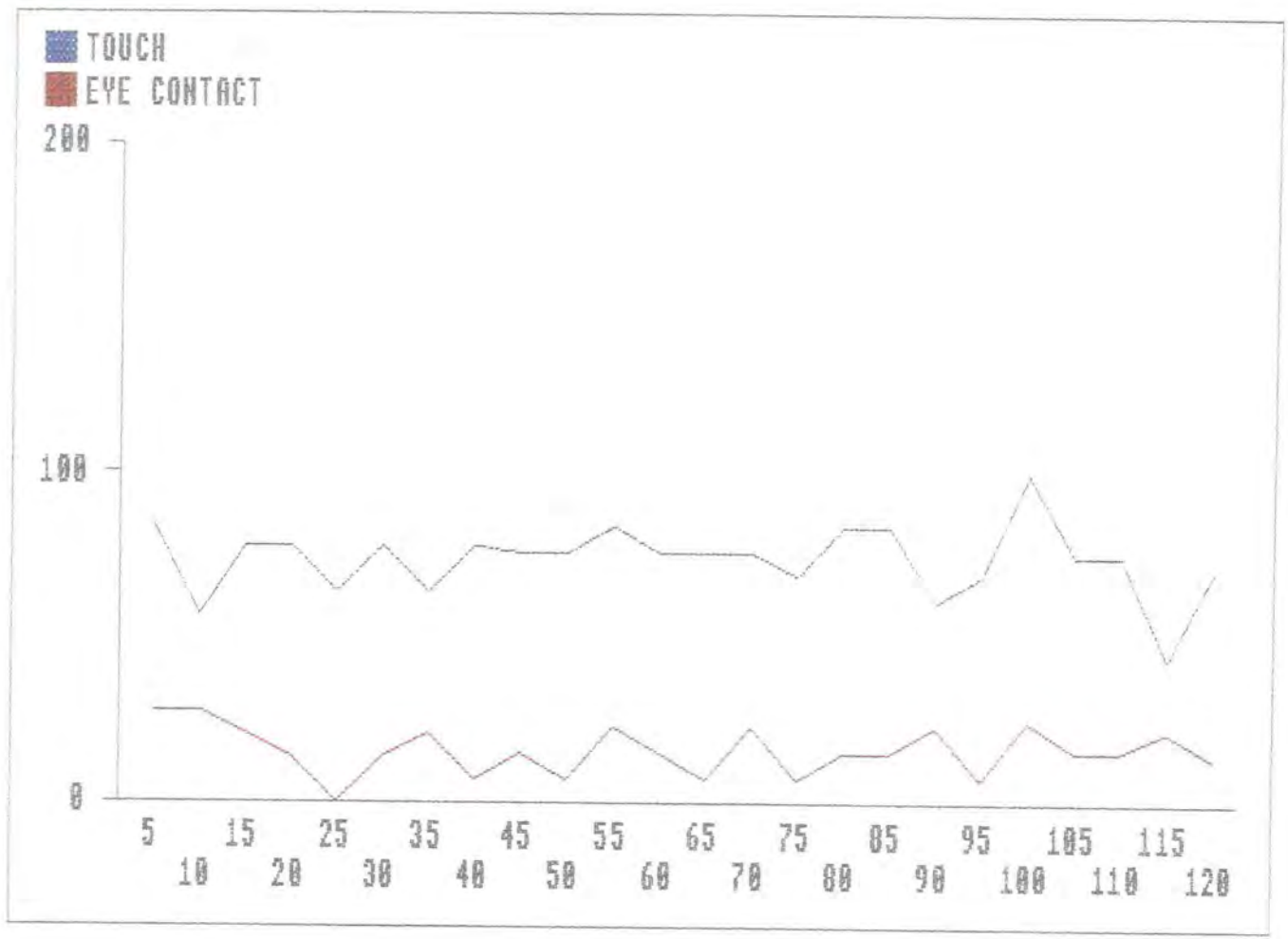
Appendix 19

Children's eye contact and adult touch

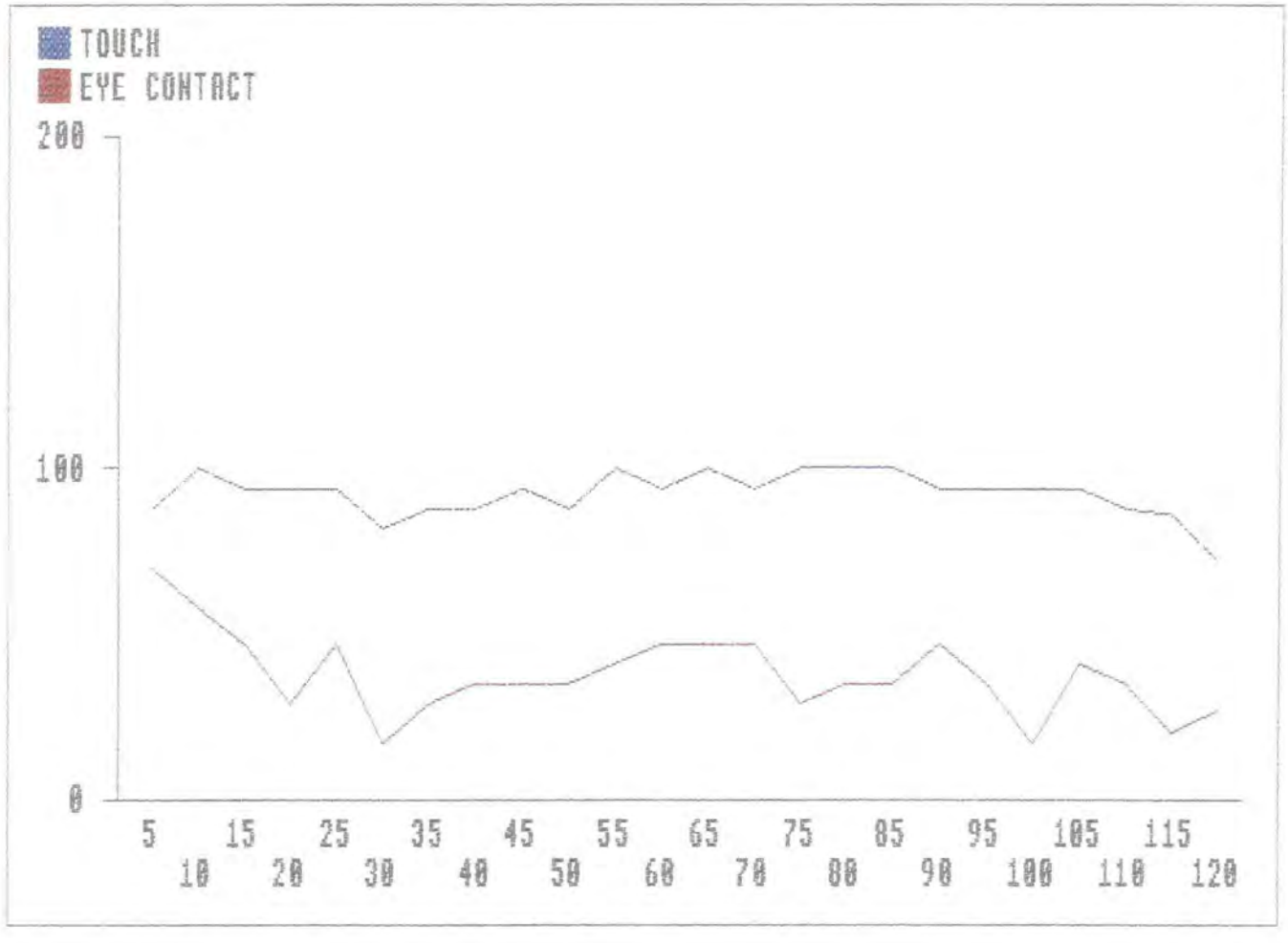

TOUCH
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: JS


TOUCH
EYE CONTACT
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
Child: MM


TOUCH
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

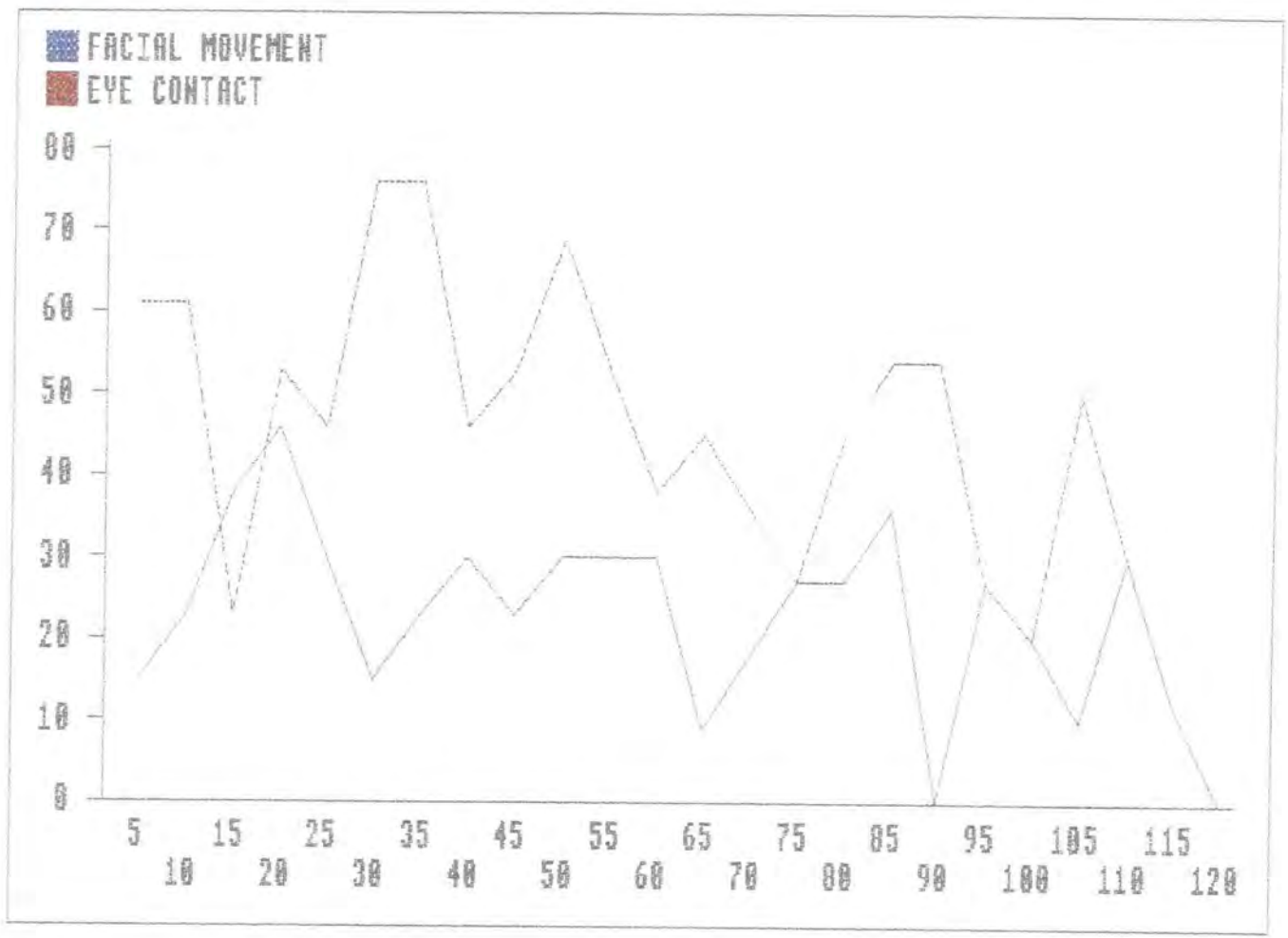
Child: AP


TOUCH
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

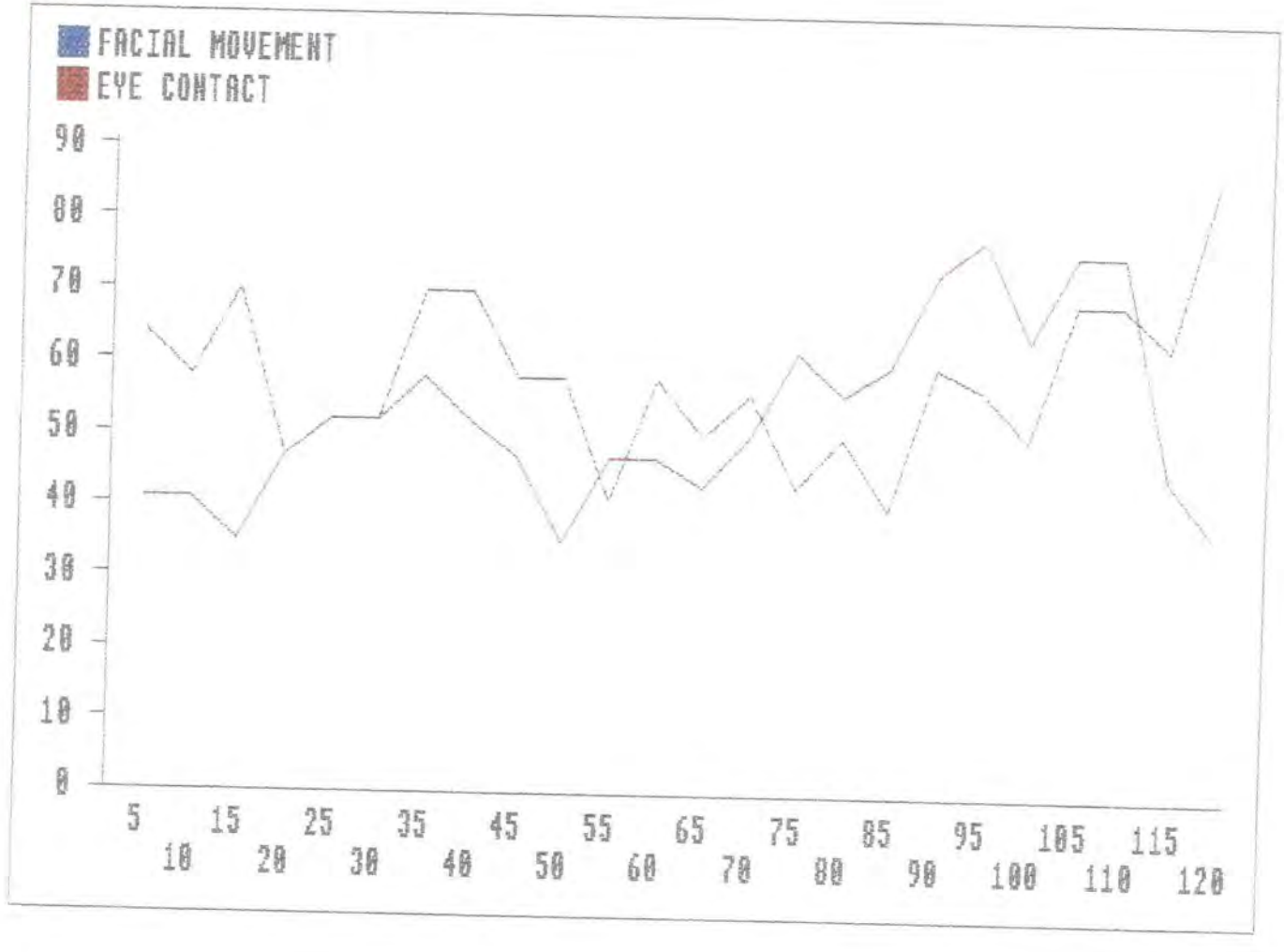
Child: DW

Appendix 20

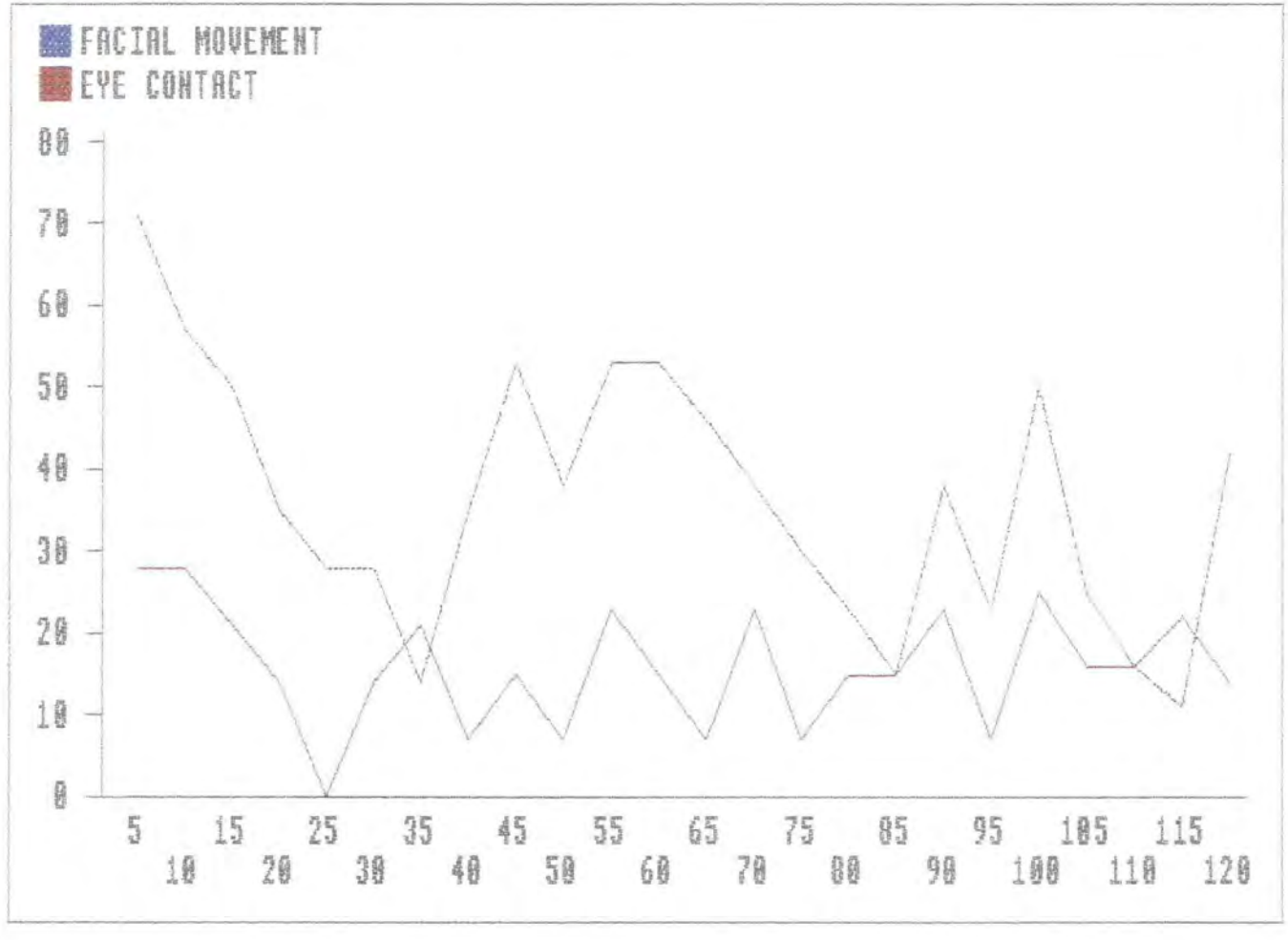
Children's eye contact and adult facial movements


FACIAL MOVEMENT
EYE CONTACT
80
70
60
50
40
30
20
10
0
5 15 25 35 45 55 65 75 85 95 105 115
10 20 30 40 50 60 70 80 90 100 110 120

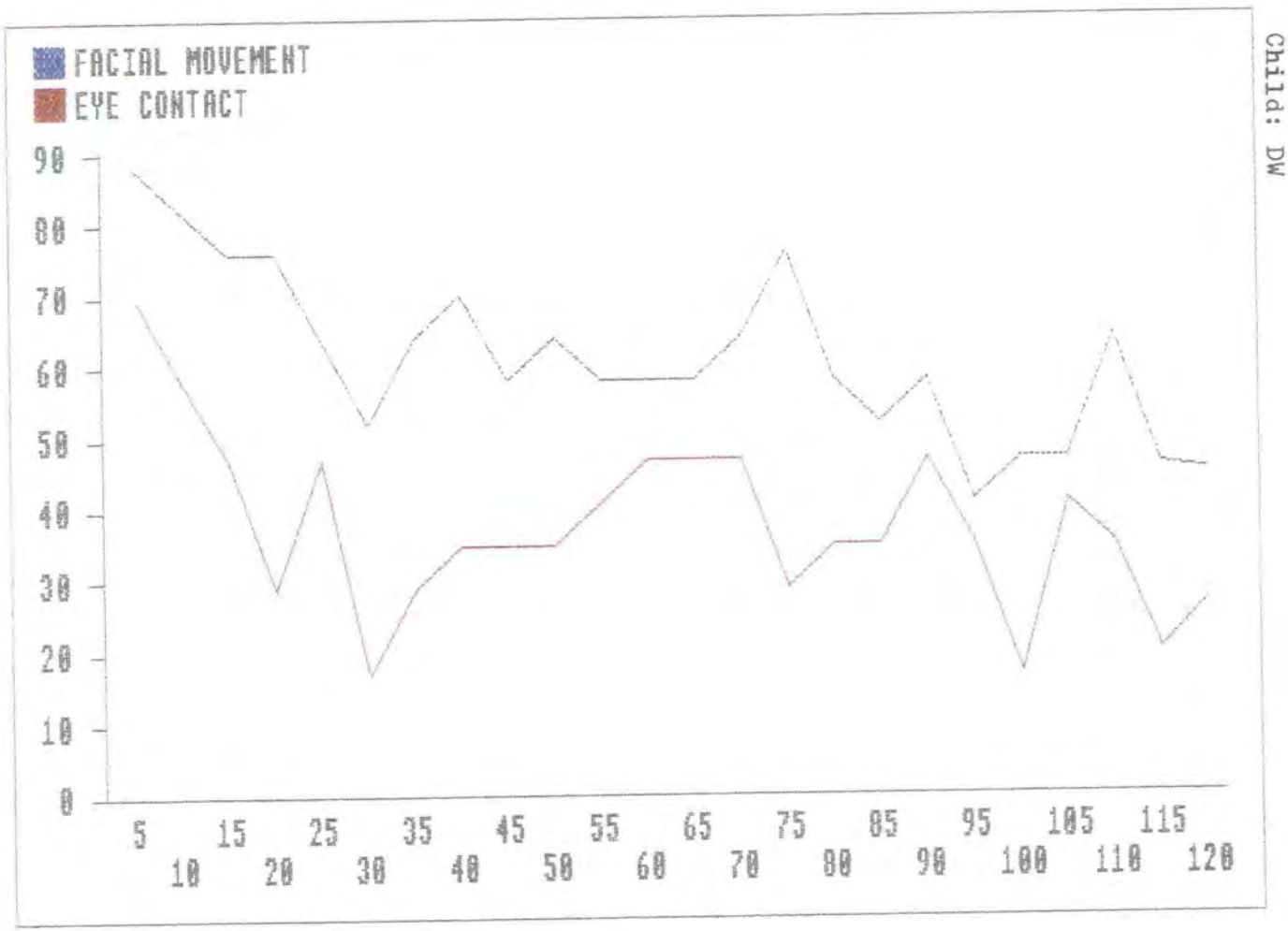
Child: JS


FACIAL MOVEMENT
EYE CONTACT
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: MM


FACIAL MOVEMENT
EYE CONTACT
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

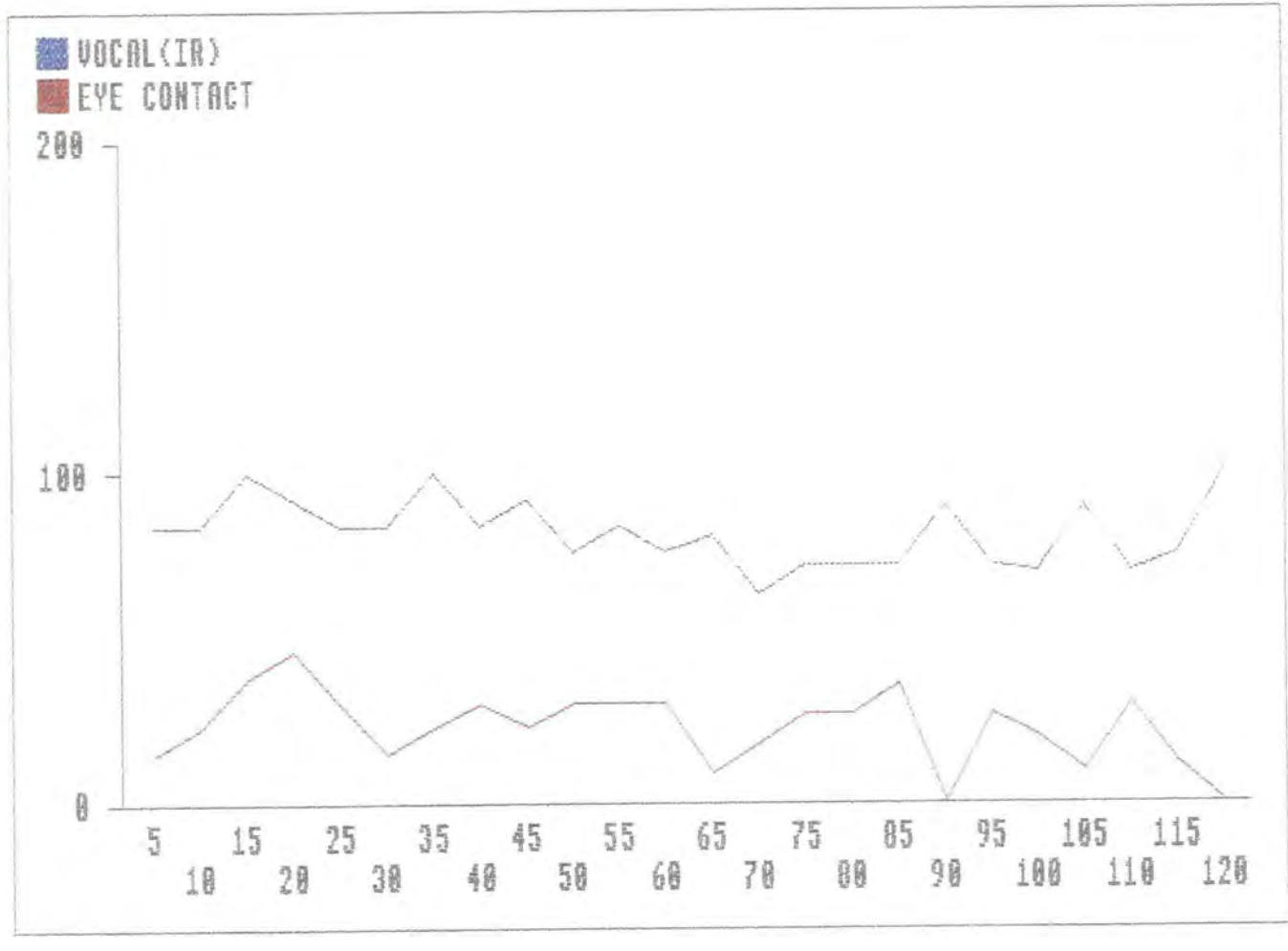
Child: AP


FACIAL MOVEMENT
EYE CONTACT
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

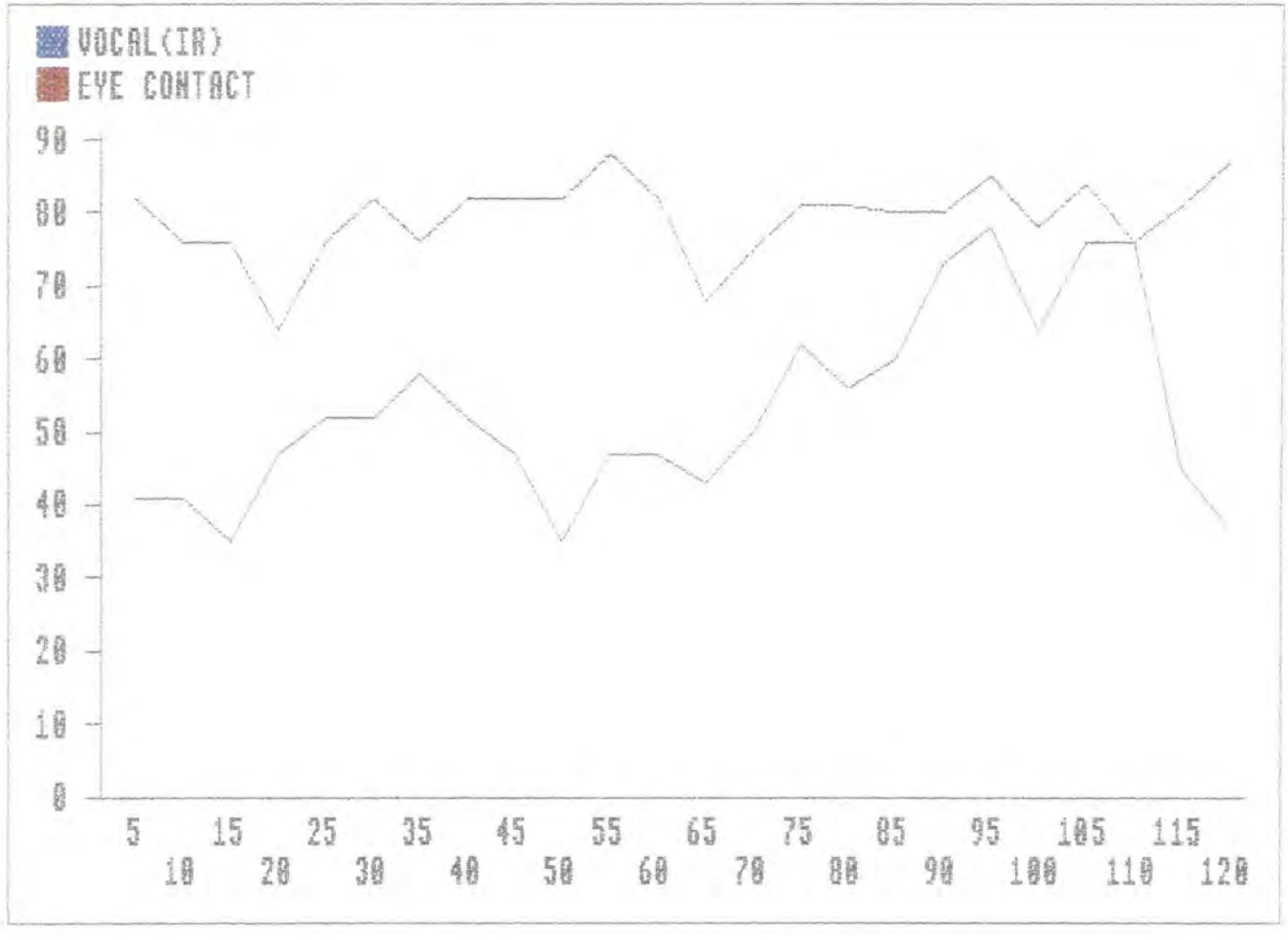
Child: DW

Appendix 21

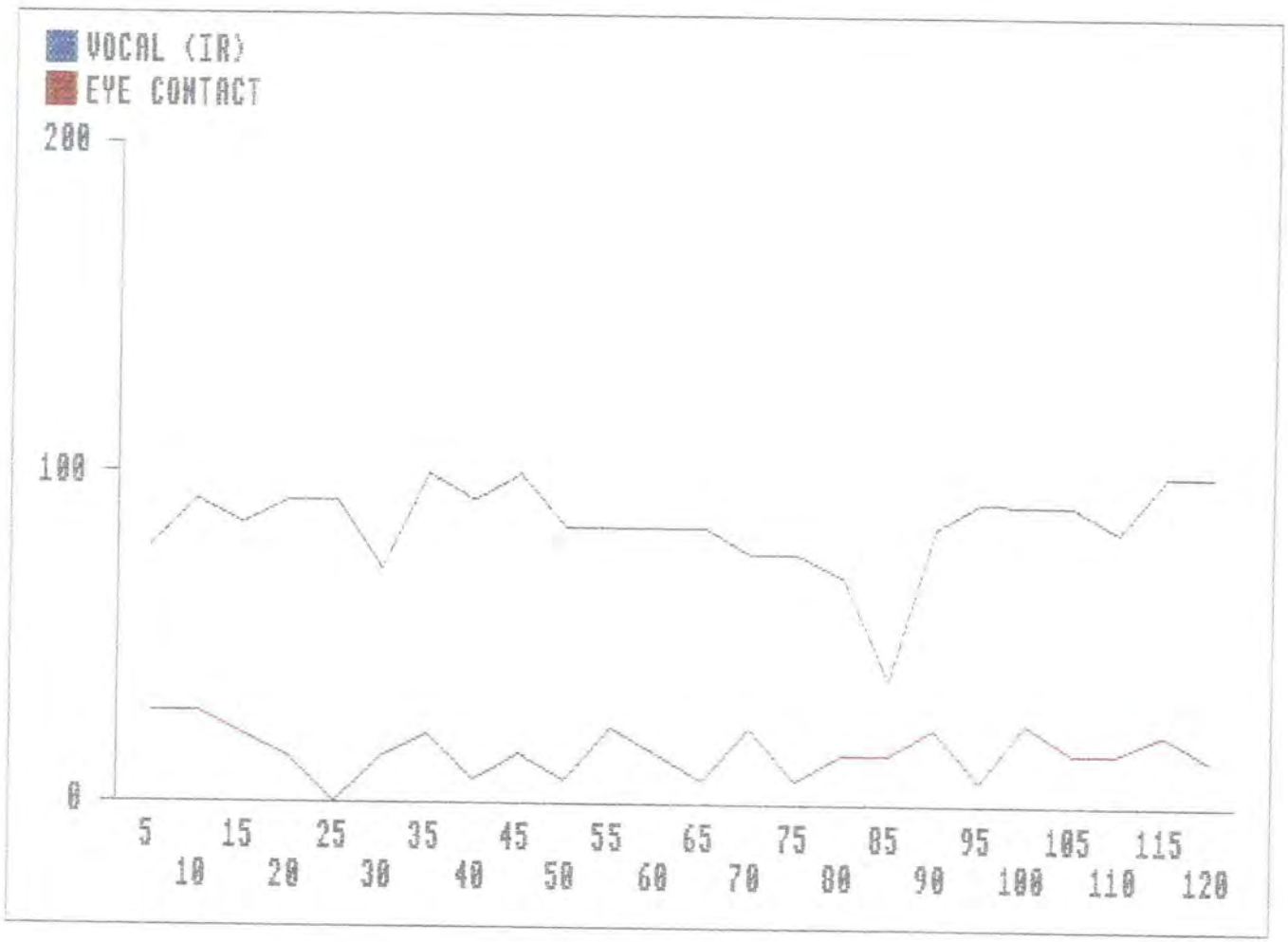
Children's eye contact and adult vocalisation


VOCAL(IR)
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

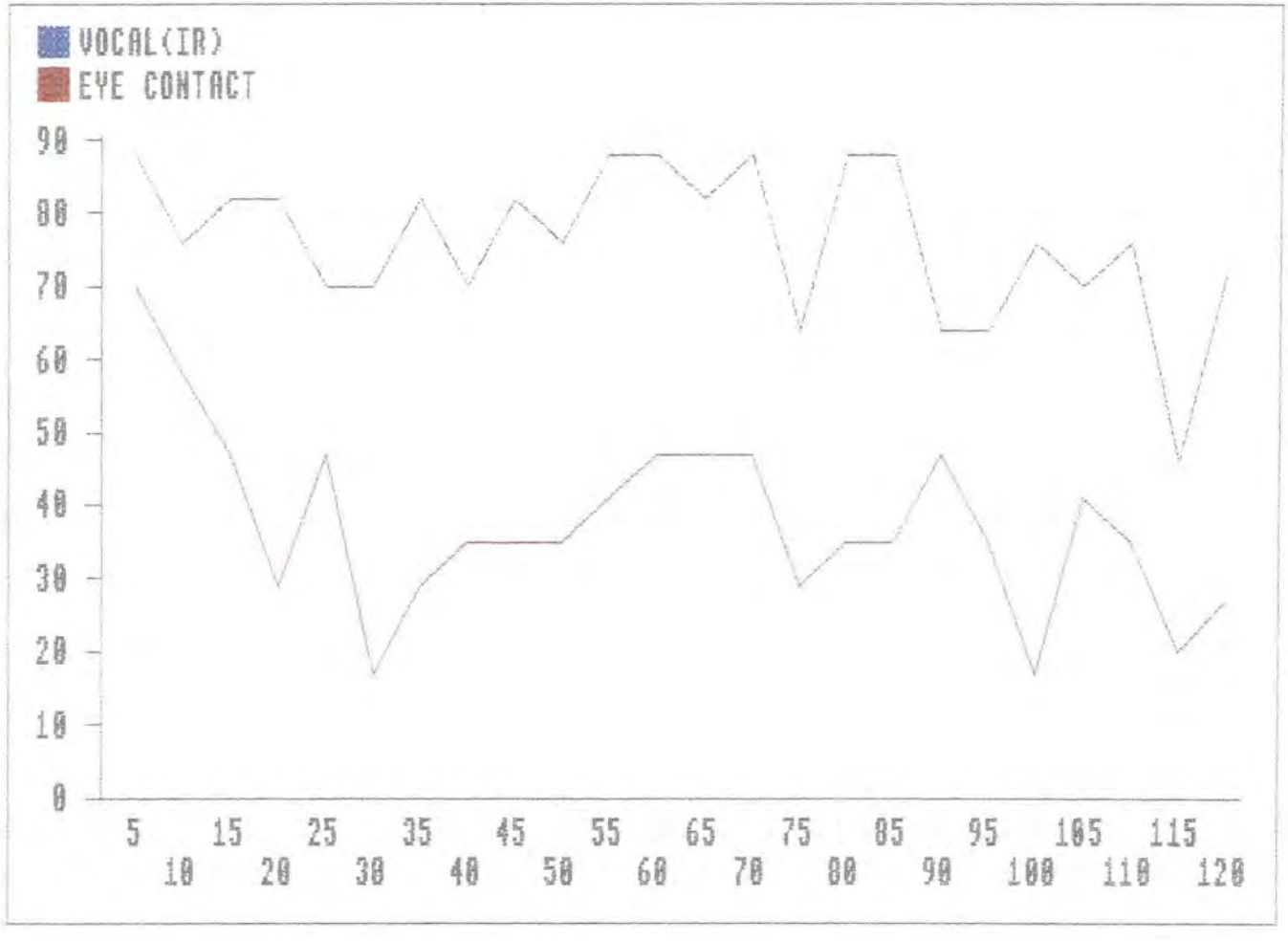
Child: JS


VOCAL(IR)
EYE CONTACT
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: MM

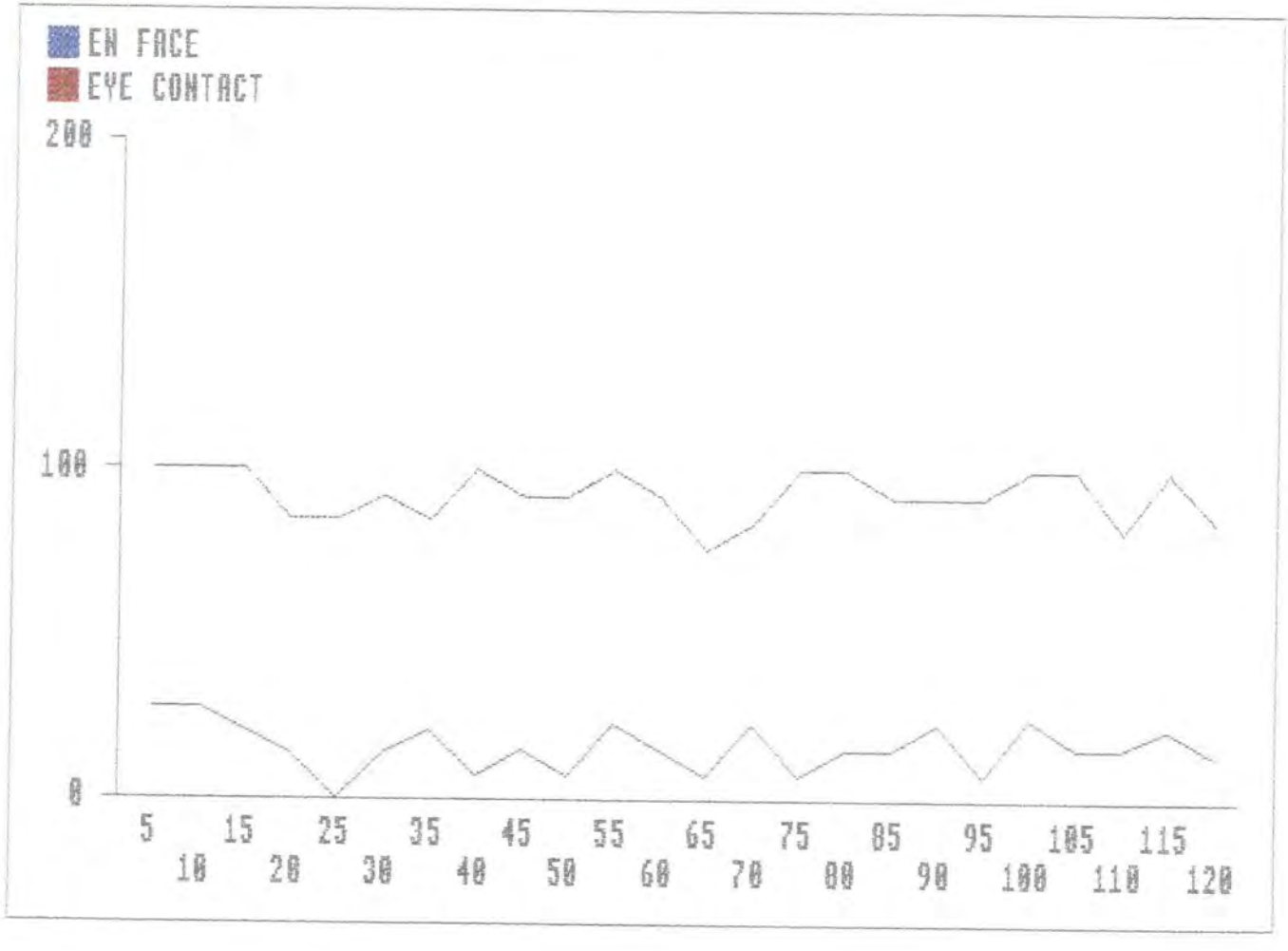

VOCAL (IR)
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: AP

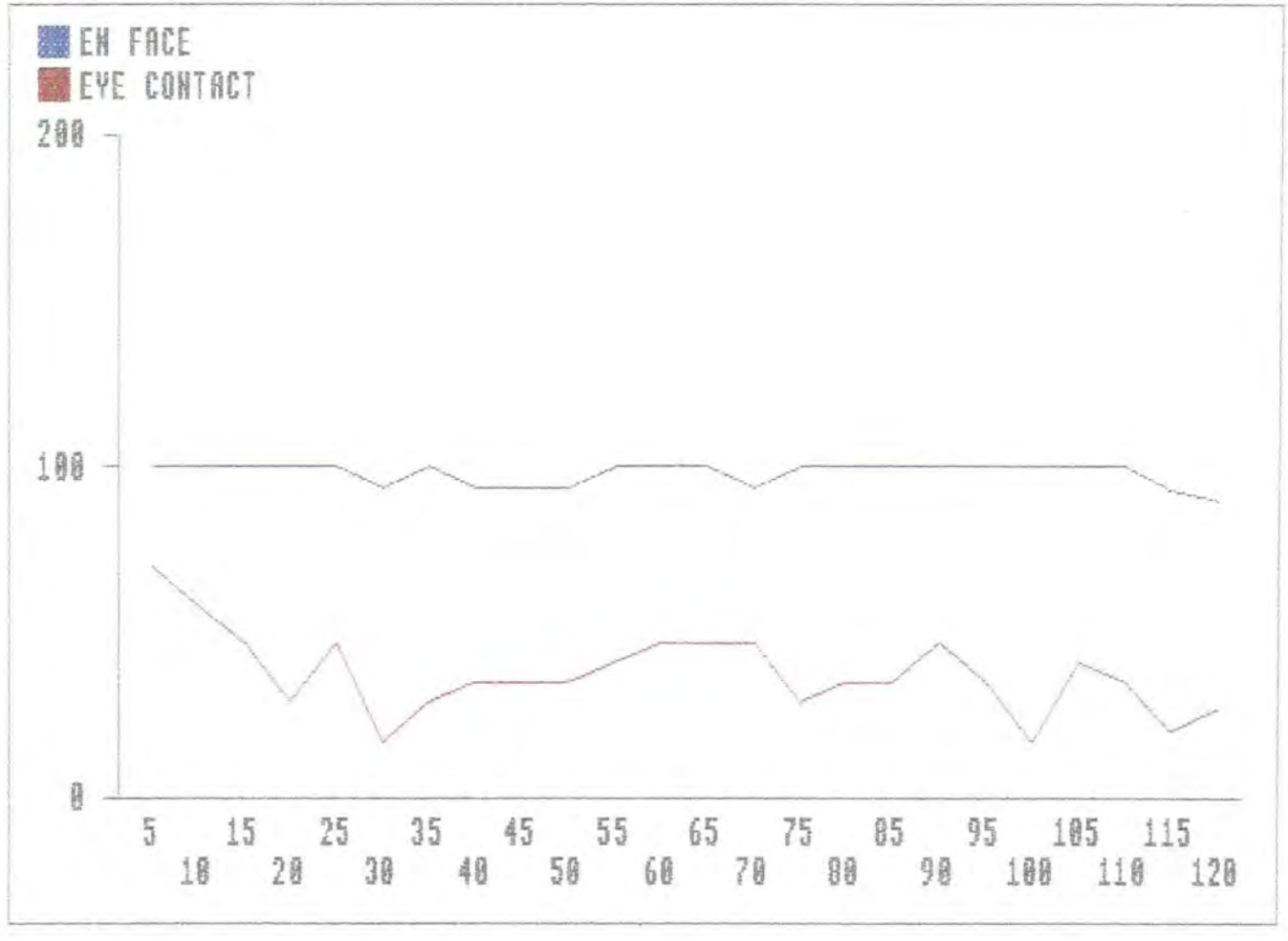

VOCAL(IR)
EYE CONTACT
90
80
70
60
50
40
30
20
10
0
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120
Child: DW

Appendix 22

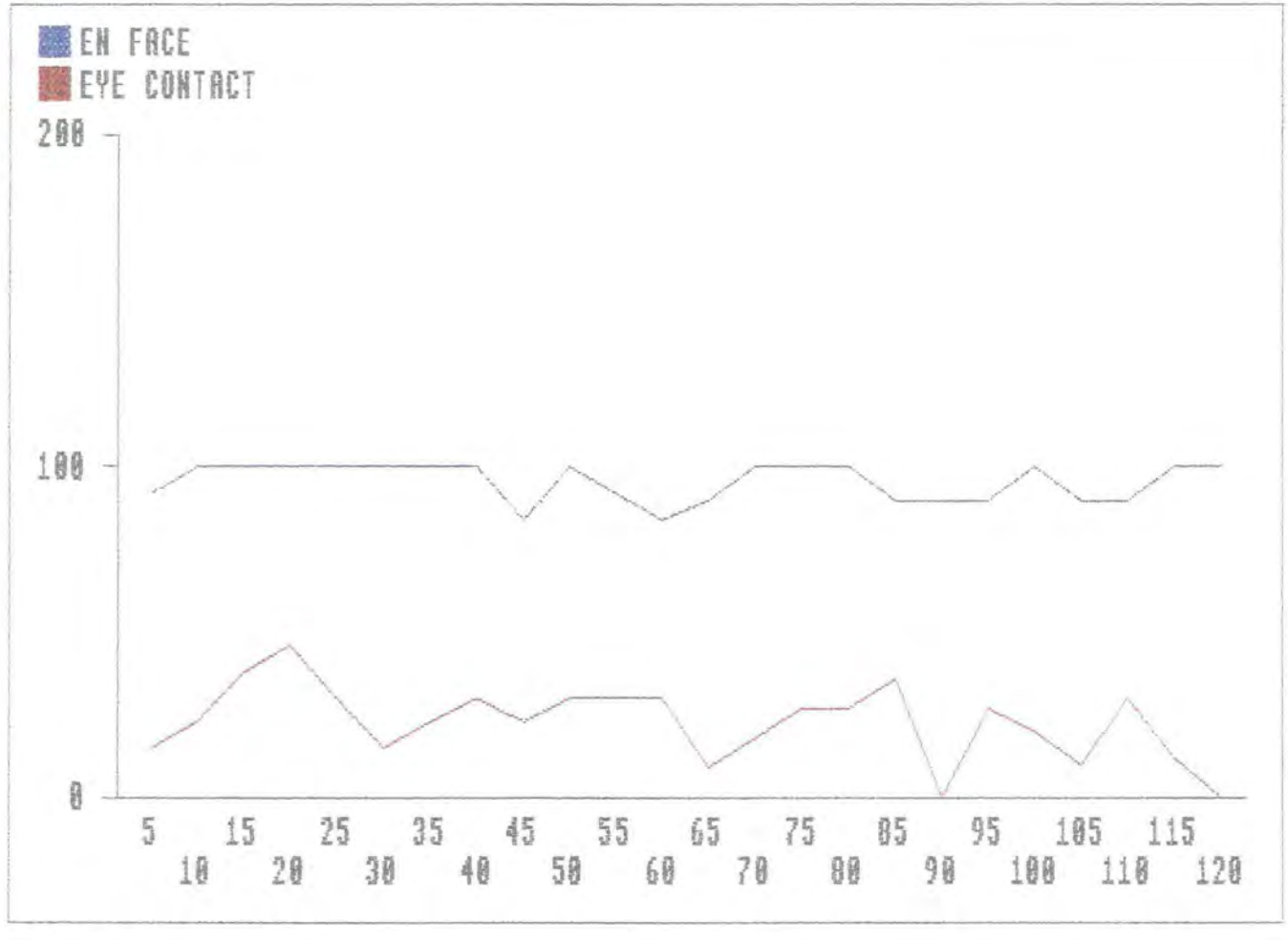
Children's eye contact and adult en face behaviour


EN FACE
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

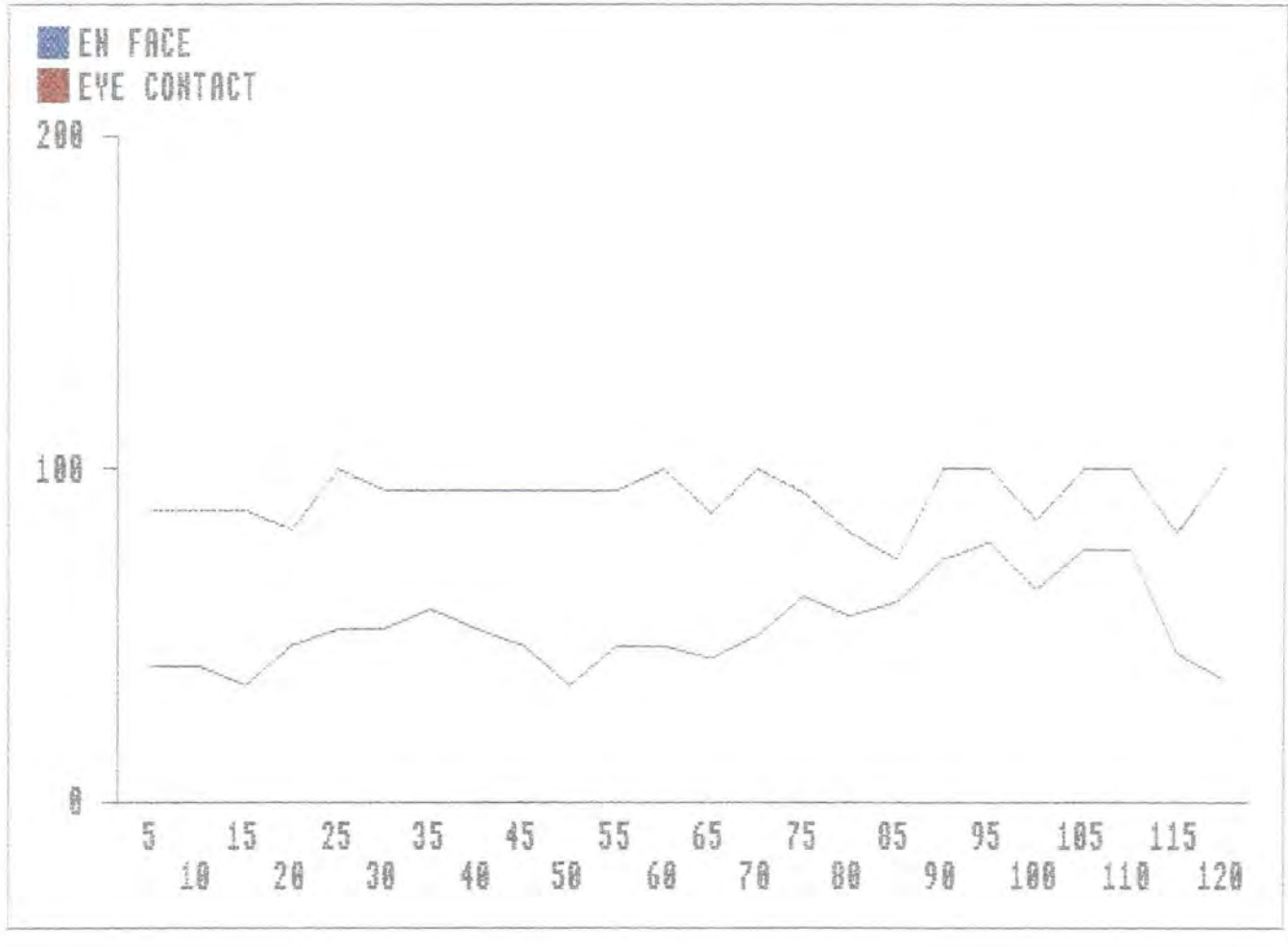
Child: AP


EN FACE
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


EN FACE
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

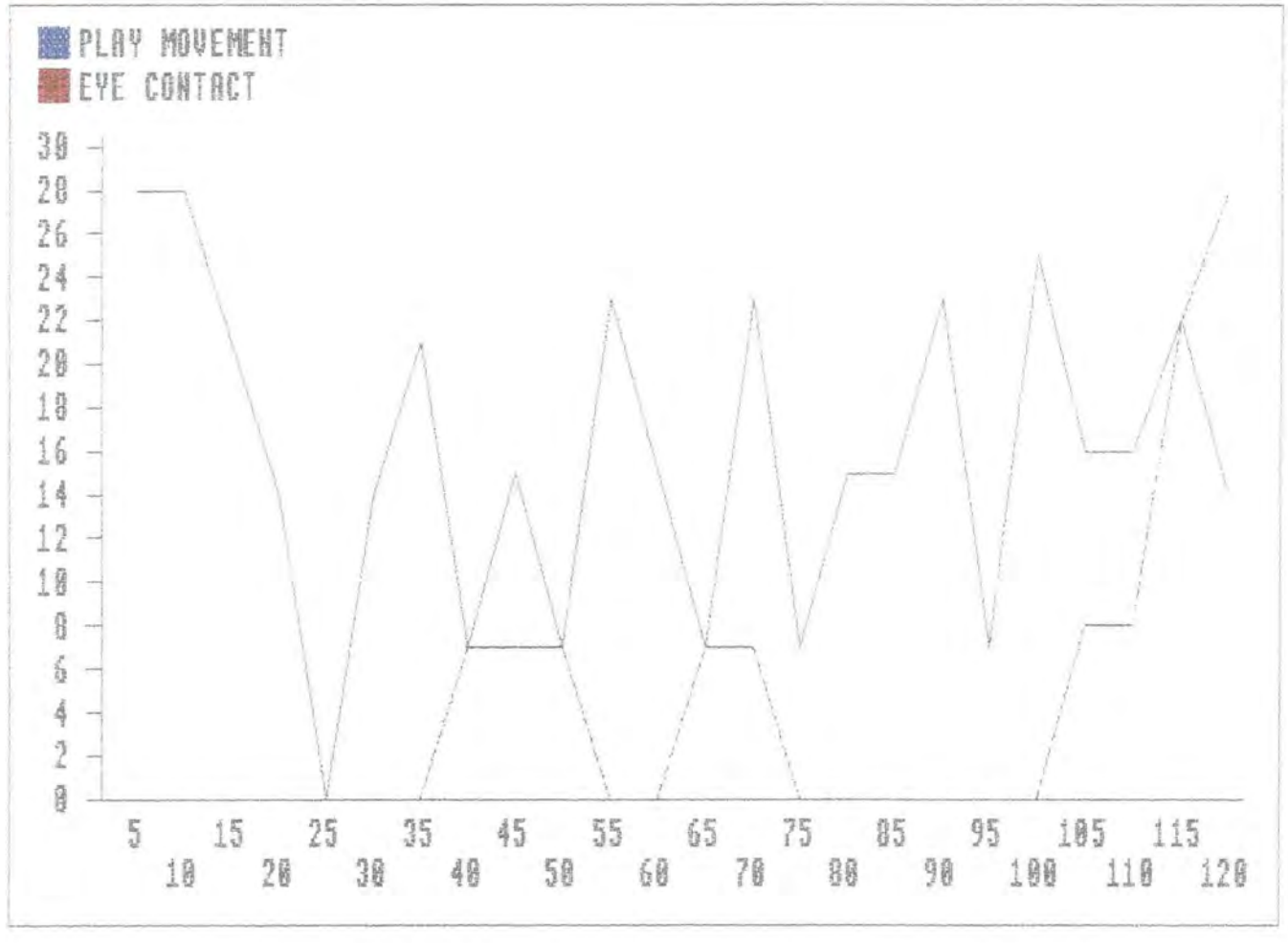
Child: JS


EN FACE
EYE CONTACT
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

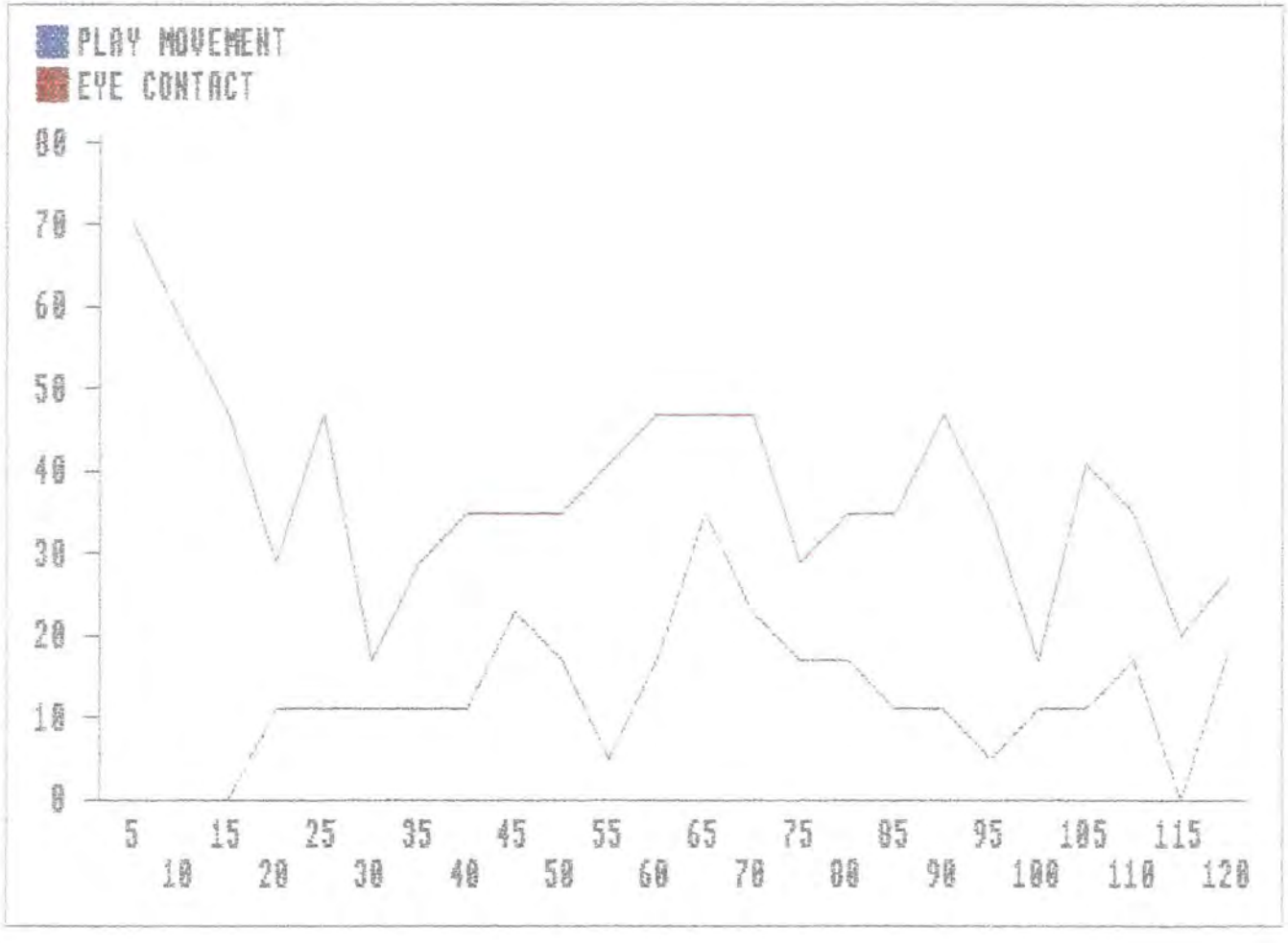
Child: MM

Appendix 23

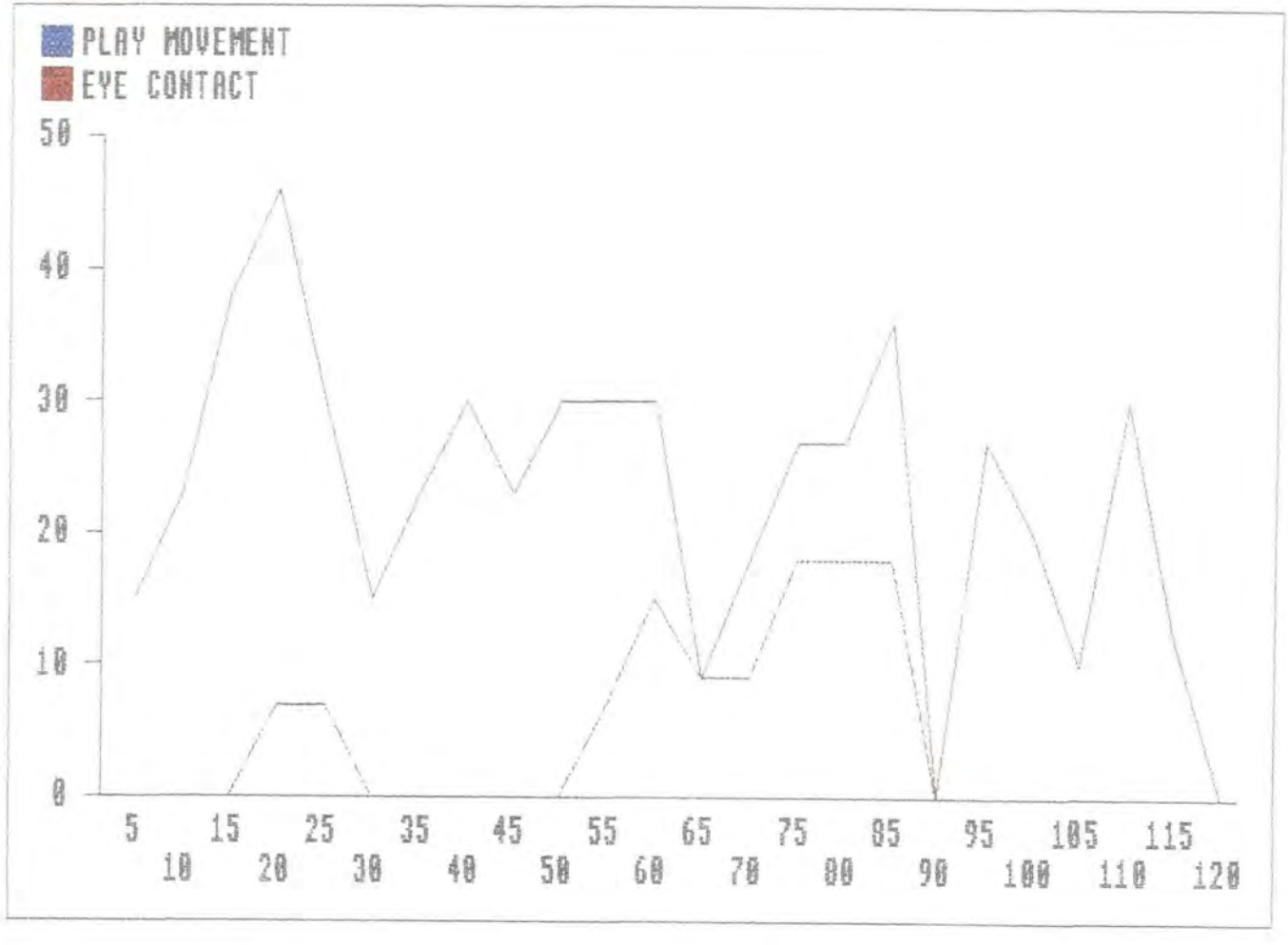
Children's eye contact and adult play movements


PLAY MOVEMENT
EYE CONTACT
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

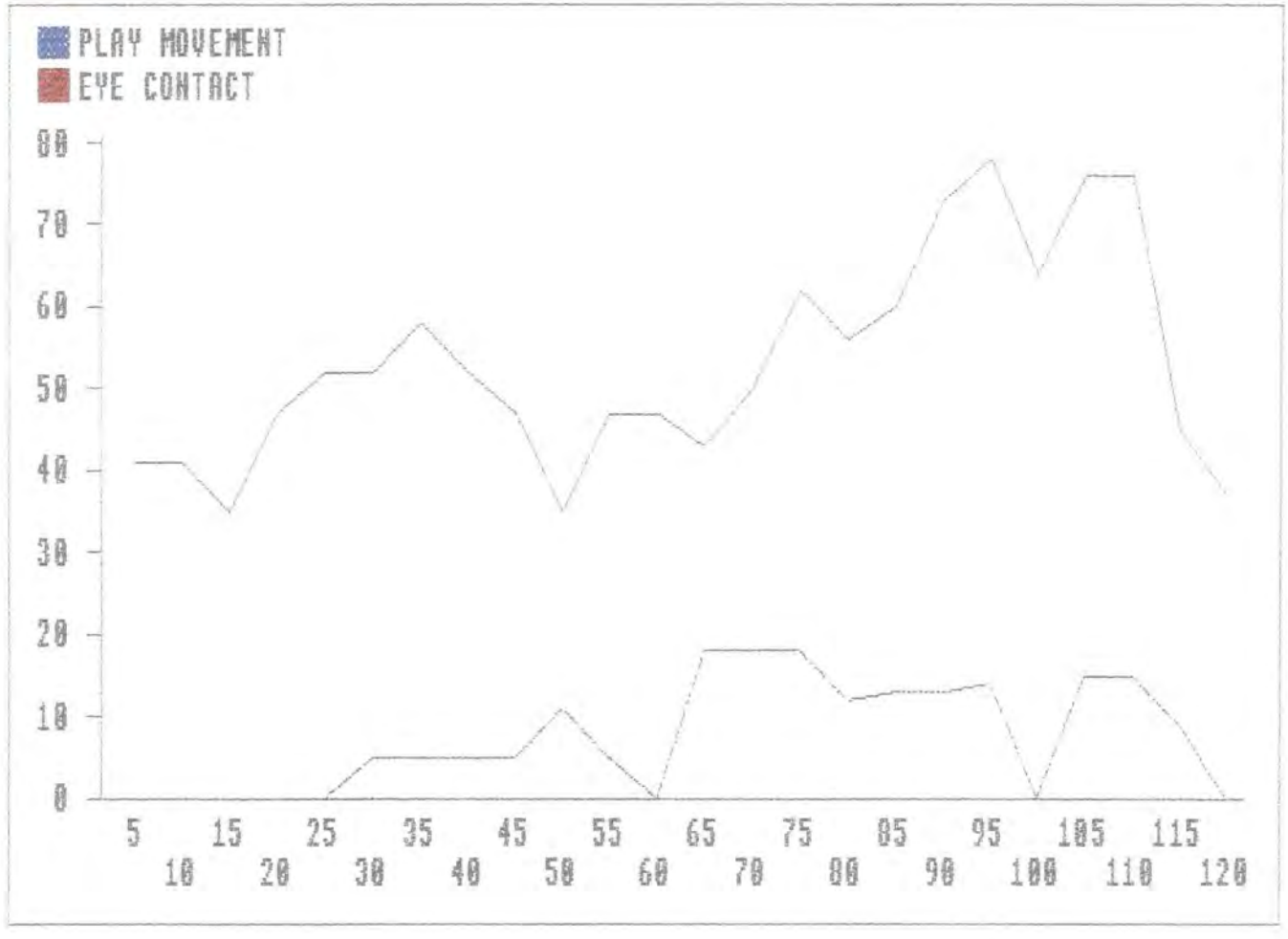
Child: AP


PLAY MOVEMENT
EYE CONTACT
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: DW


PLAY MOVEMENT
EYE CONTACT
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

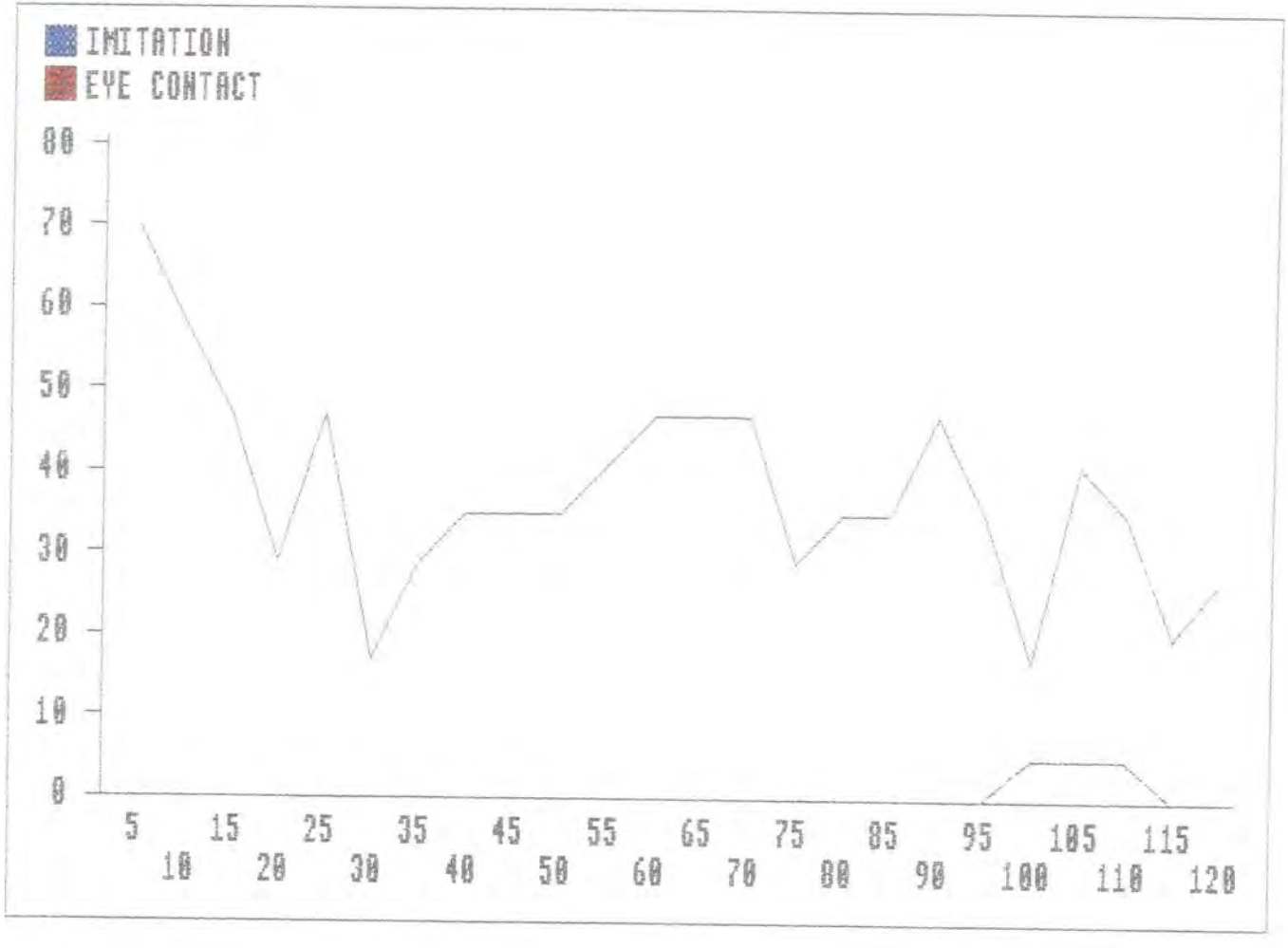
Child: JS


PLAY MOVEMENT
EYE CONTACT
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

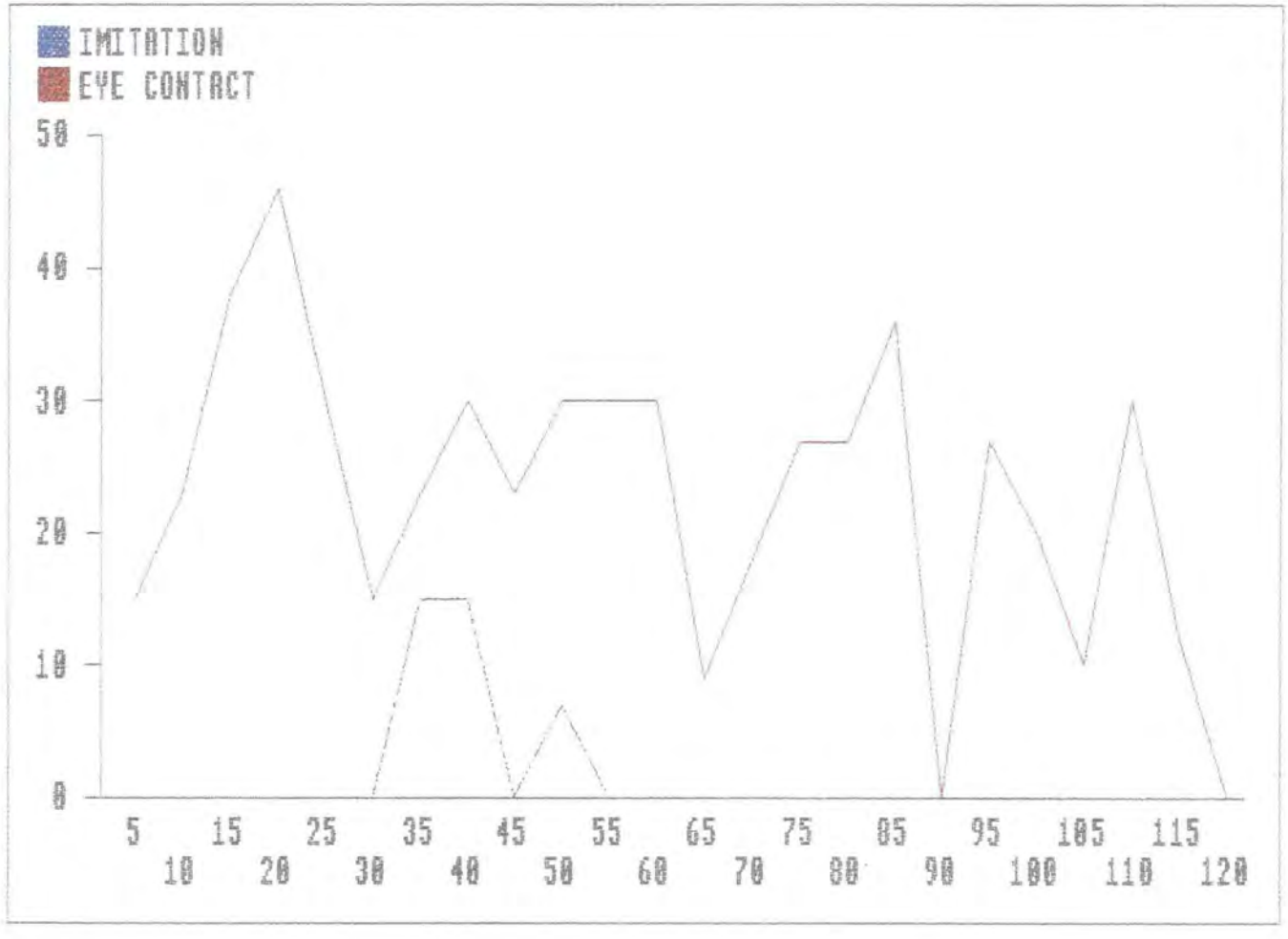
Child: MM

Appendix 24

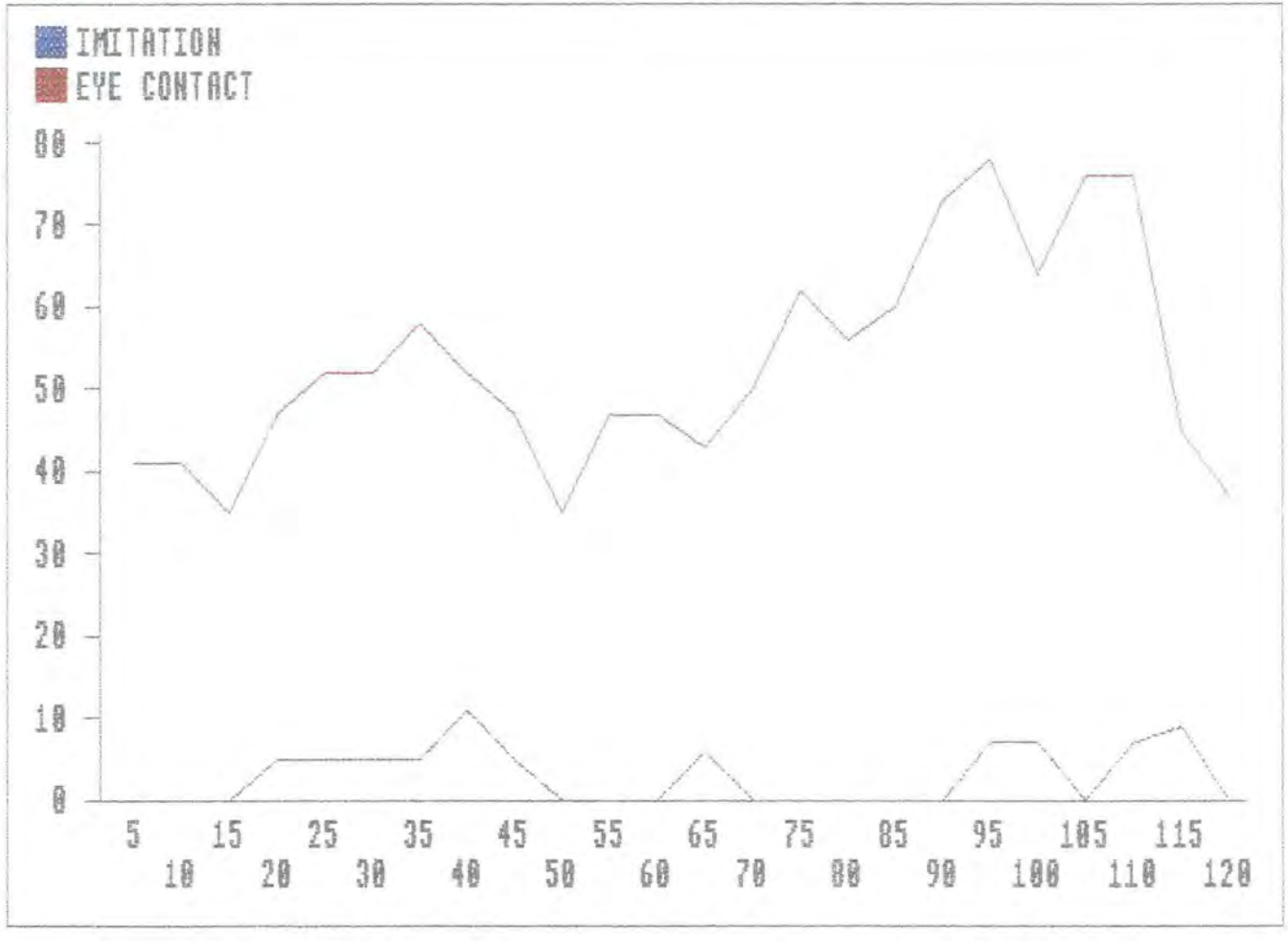
Children's eye contact and adult imitation


IMITATION
EYE CONTACT
80
70
60
50
40
30
20
10
0
5 15 25 35 45 55 65 75 85 95 105 115
10 20 30 40 50 60 70 80 90 100 110 120

Child: DW


IMITATION
EYE CONTACT
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

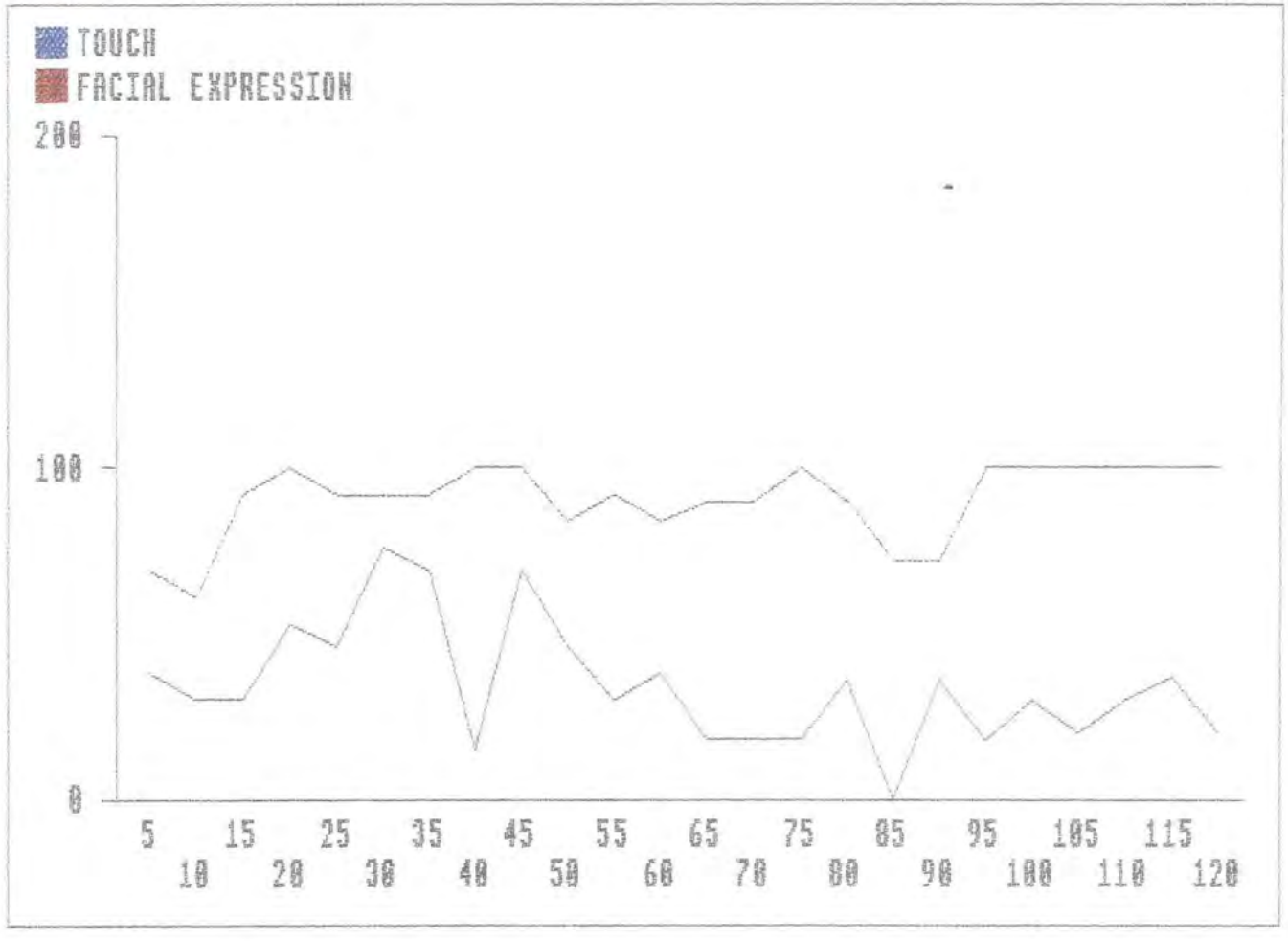
Child: JS


IMITATION
EYE CONTACT
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

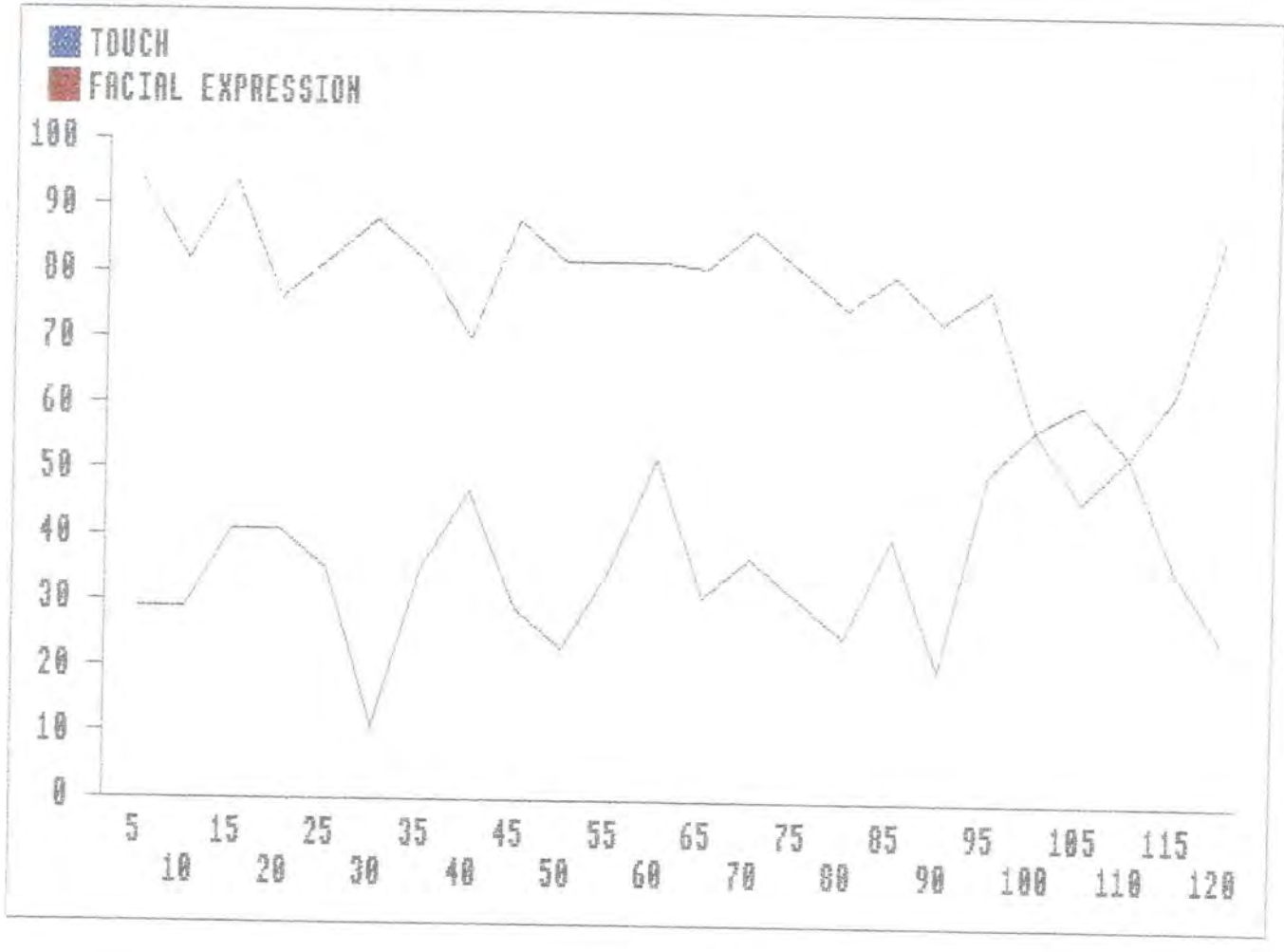
Child: MM

Appendix 25

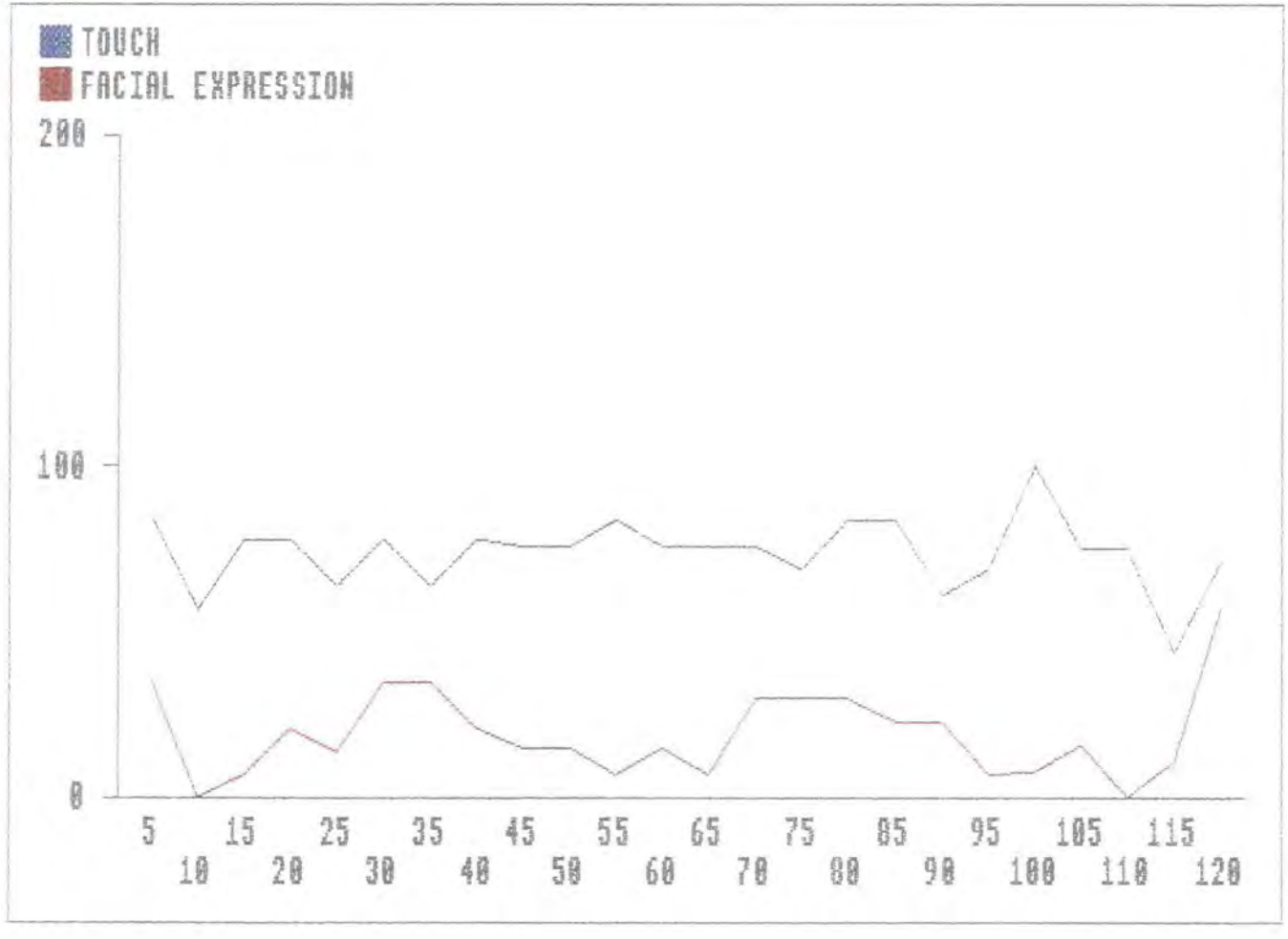
Children's facial expression and adult touch


TOUCH
FACIAL EXPRESSION
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

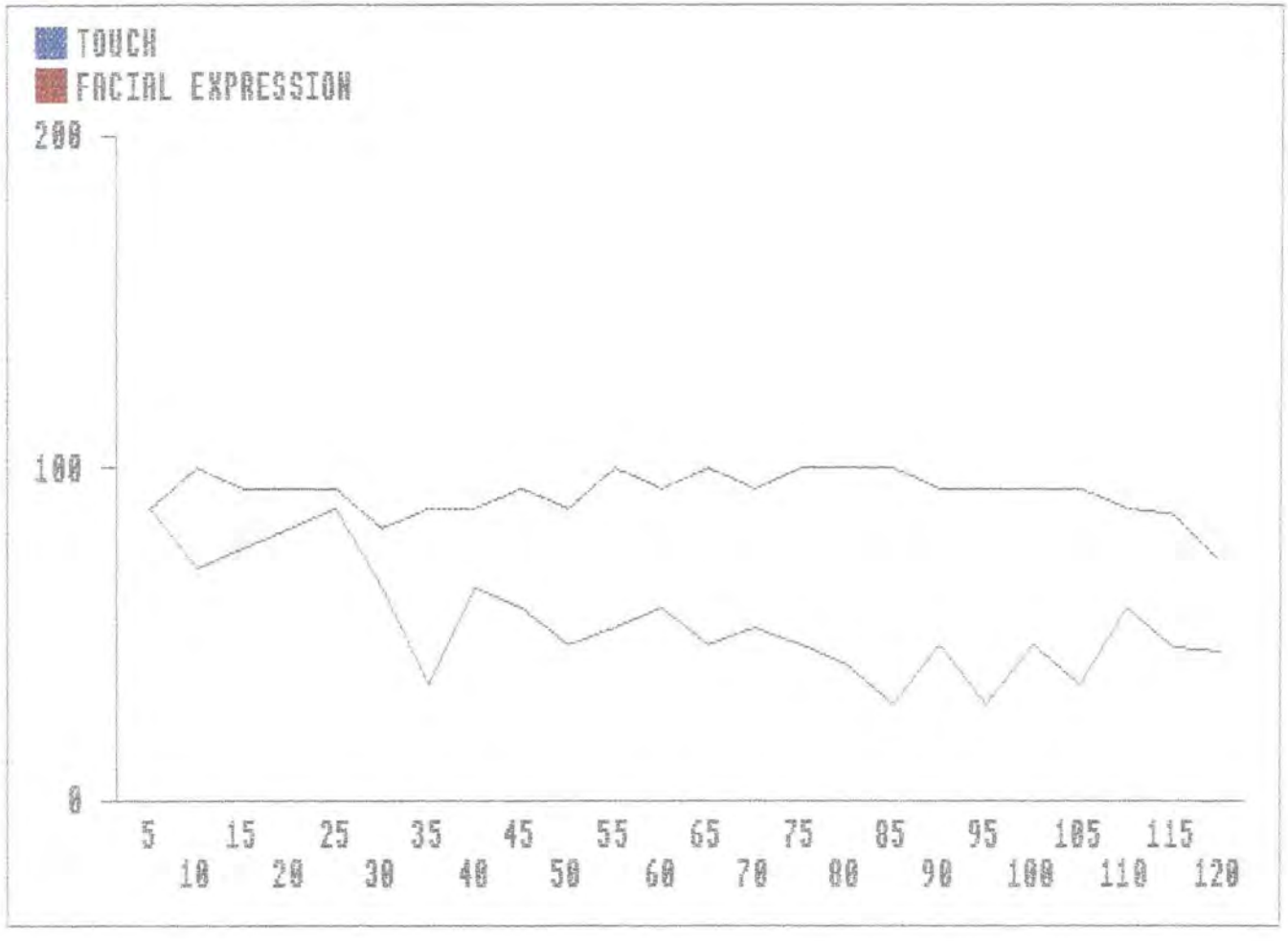
Child: JS


TOUCH
FACIAL EXPRESSION
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: MM


TOUCH
FACIAL EXPRESSION
200
100
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Child: AP


TOUCH
FACIAL EXPRESSION
200
100
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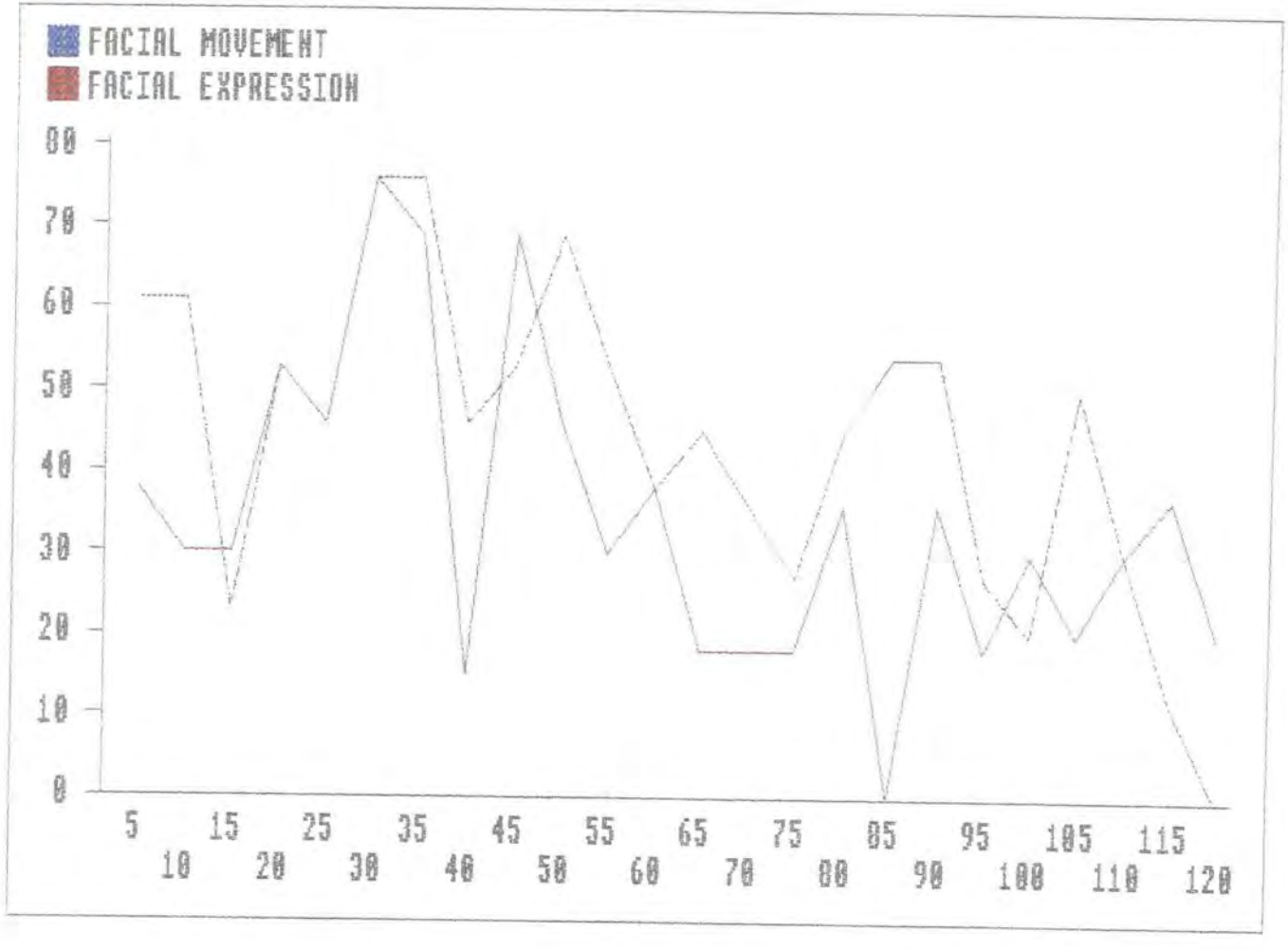
105
110
115
120

Child: DW

Appendix 26

Children's facial expression and adult facial movements


FACIAL MOVEMENT
FACIAL EXPRESSION
80
70
60
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105
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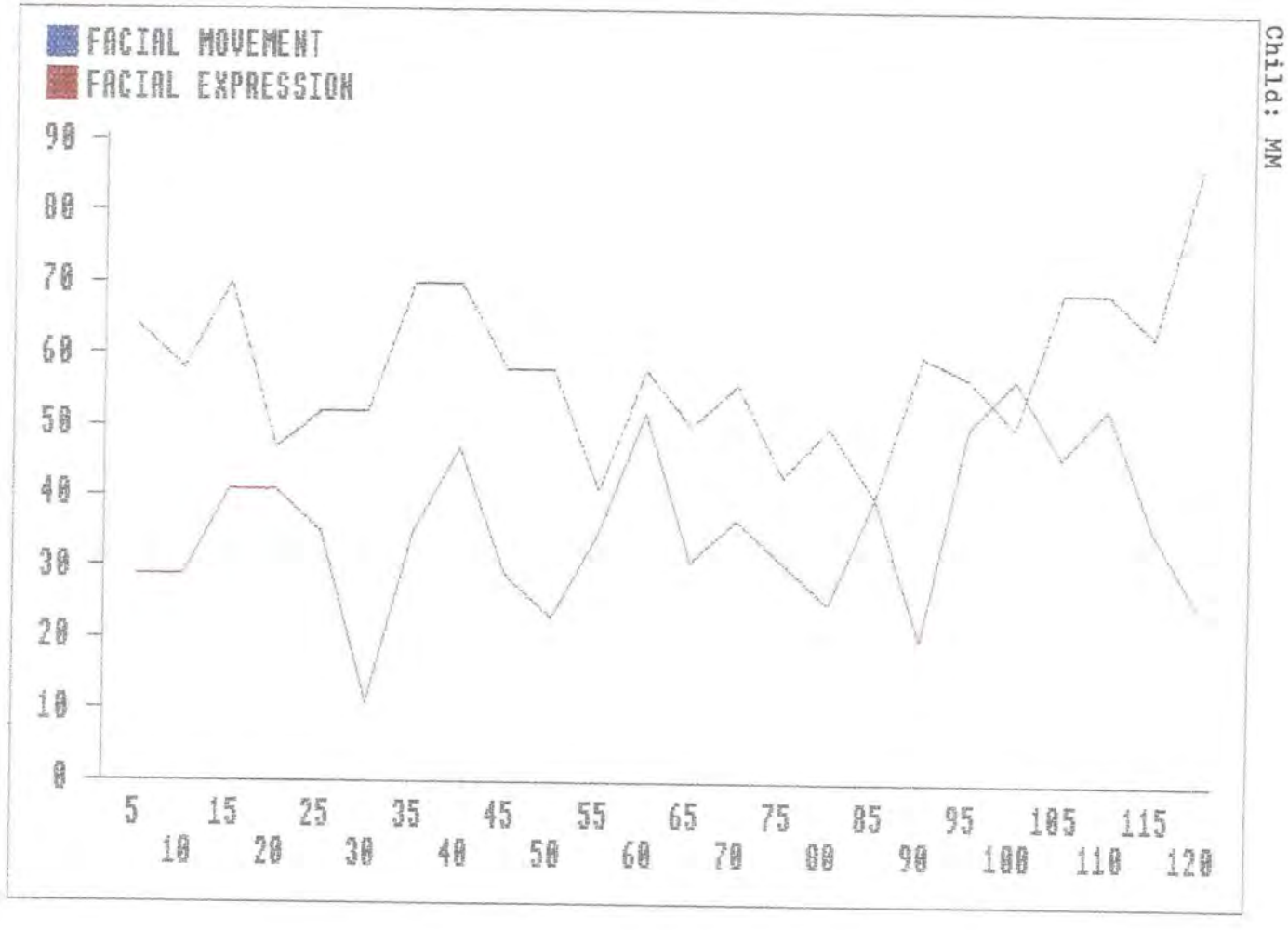
115
120

Child: JS


FACIAL MOVEMENT
FACIAL EXPRESSION
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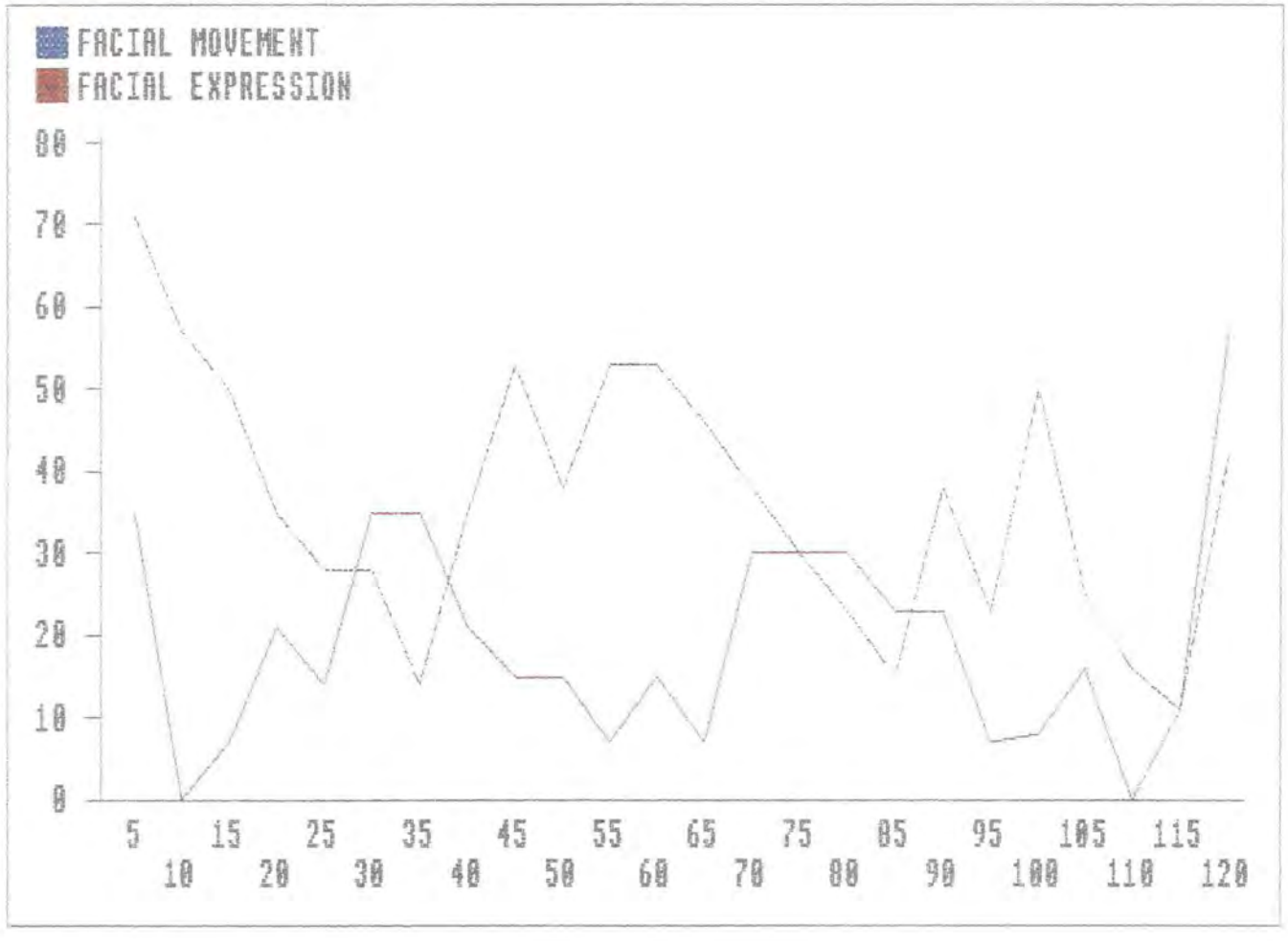
Child: MM


FACIAL MOVEMENT
FACIAL EXPRESSION
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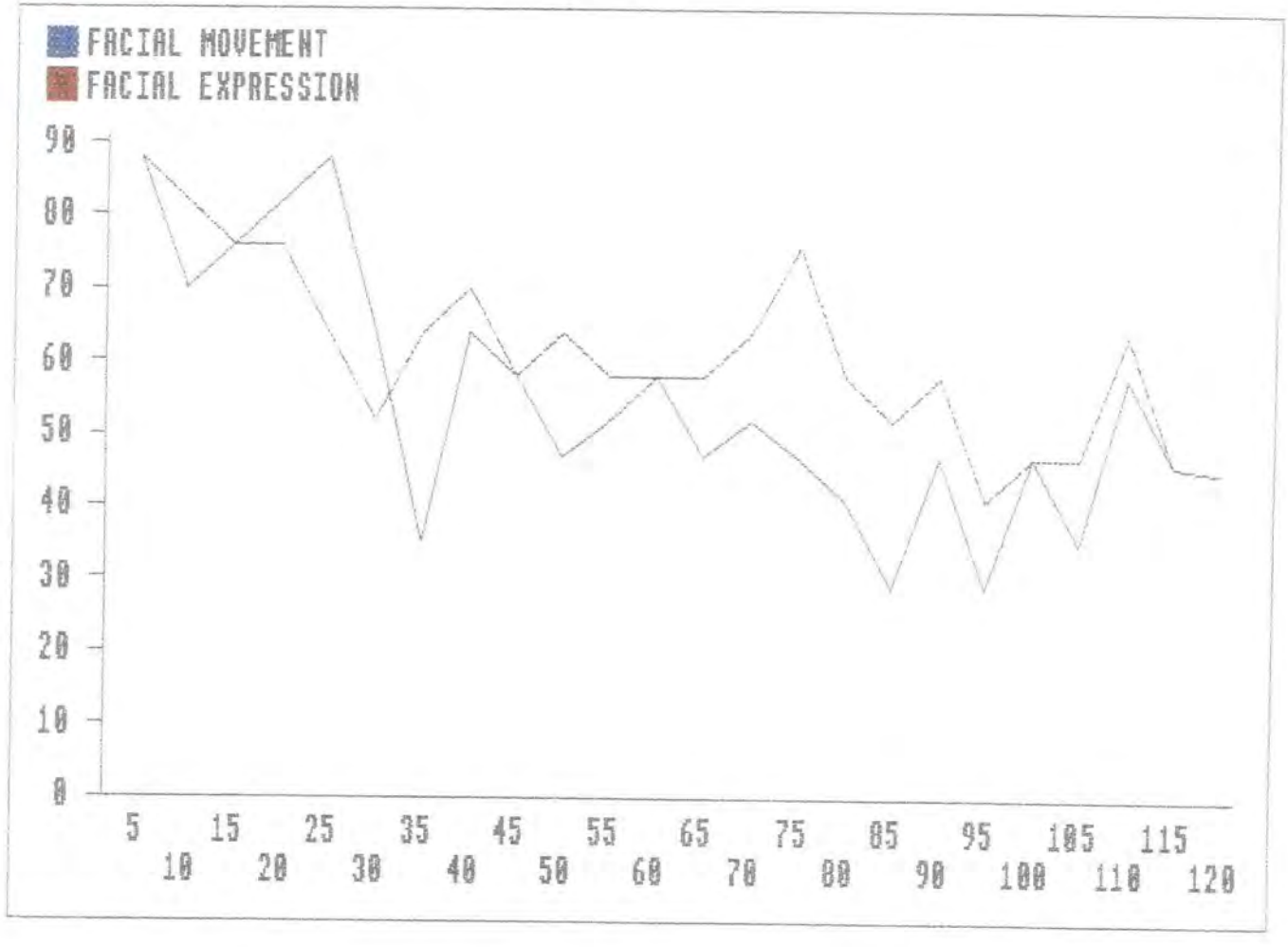
child:nP


FACIAL MOVEMENT
FACIAL EXPRESSION
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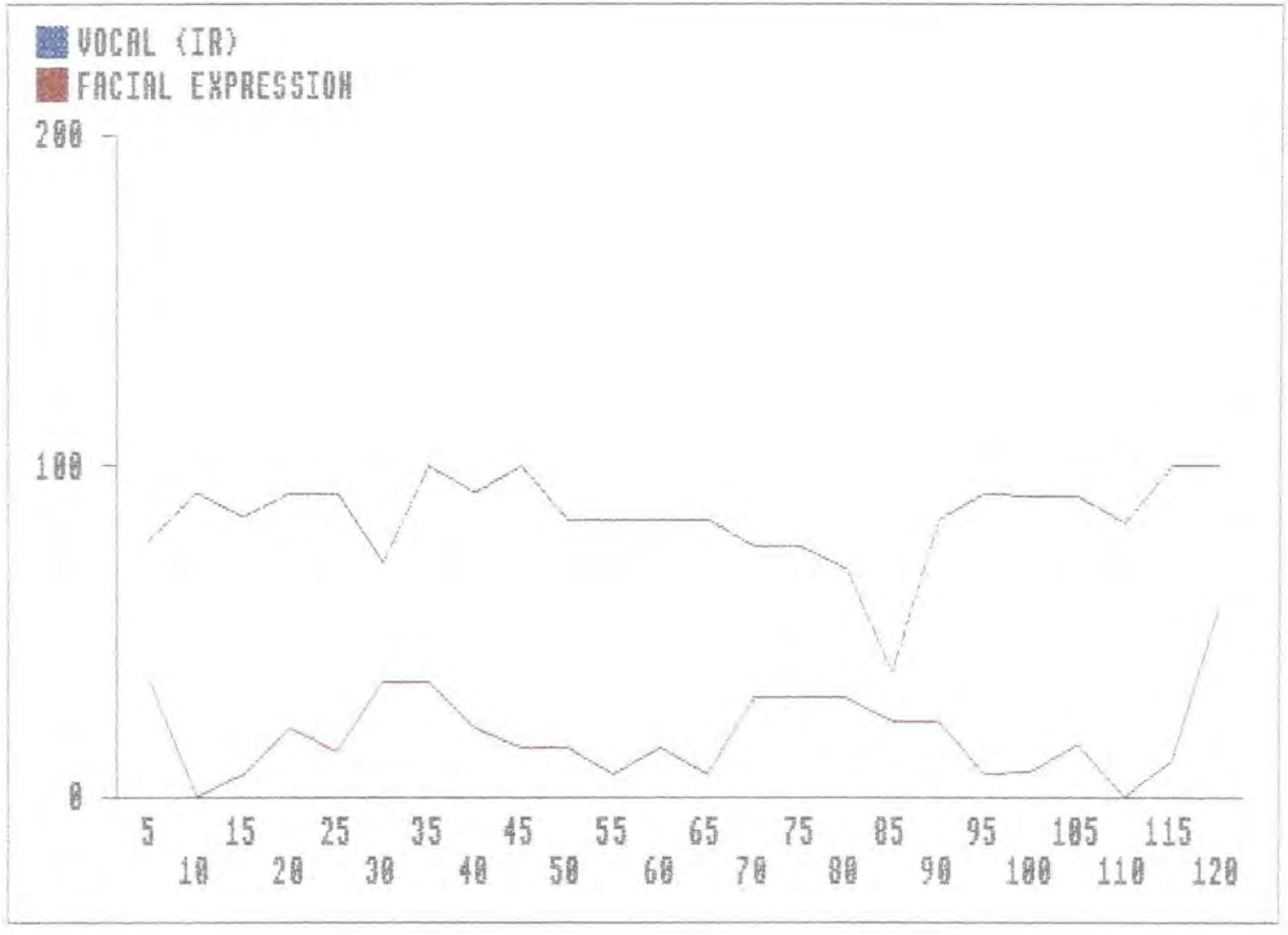
Child: DW

Appendix 27

Children's facial expression and adult vocalisation


VOCAL (IR)
FACIAL EXPRESSION
200
100
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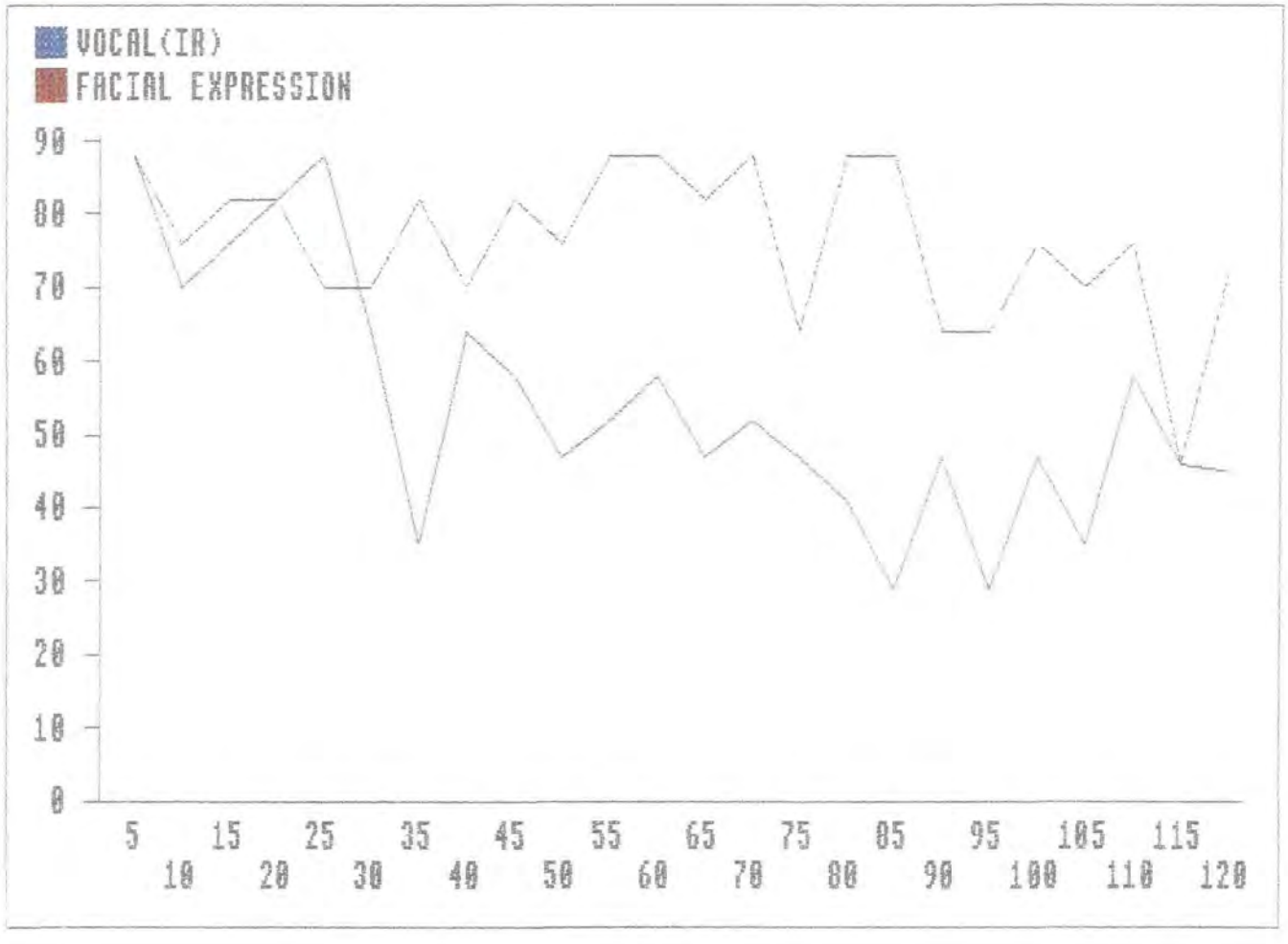
115
120

Child: AP


VOCAL(IR)
FACIAL EXPRESSION
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60
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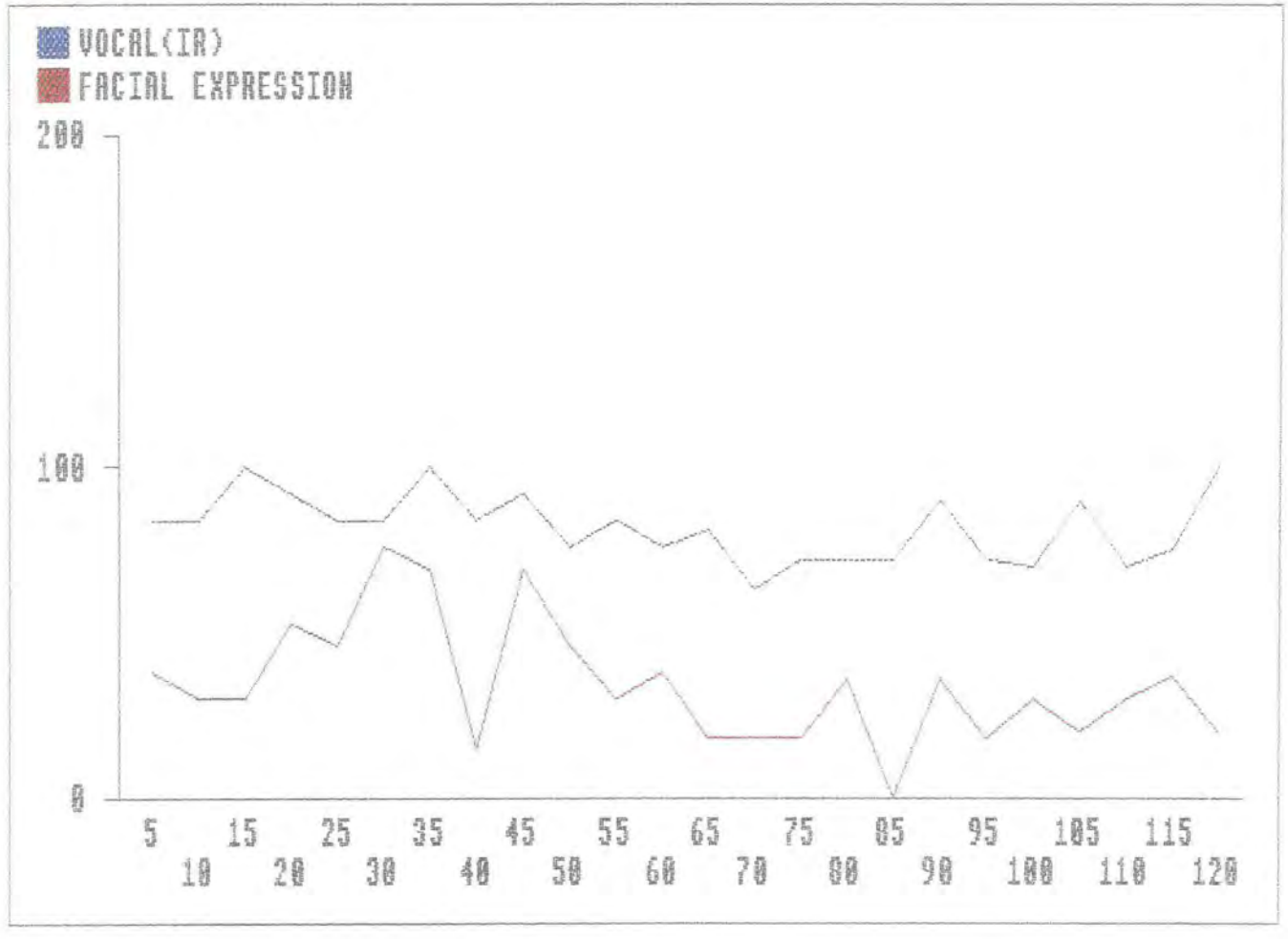
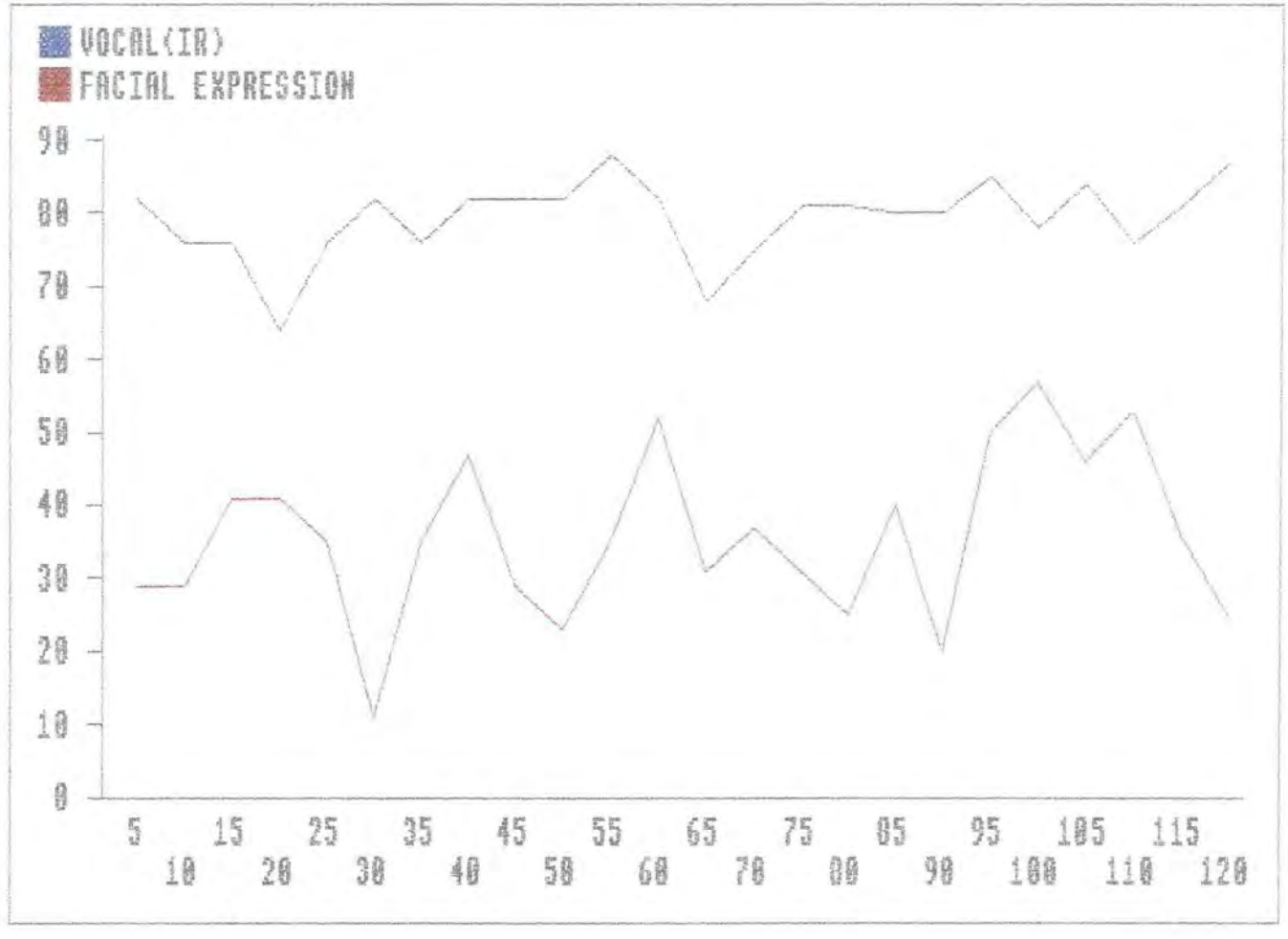
120

Child: DW


VOCAL(IR)
FACIAL EXPRESSION
200
100
0
5 15 25 35 45 55 65 75 85 95 105 115
10 20 30 40 50 60 70 80 90 100 110 120

Child: JS


VOCAL(IR)
FACIAL EXPRESSION
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105
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115
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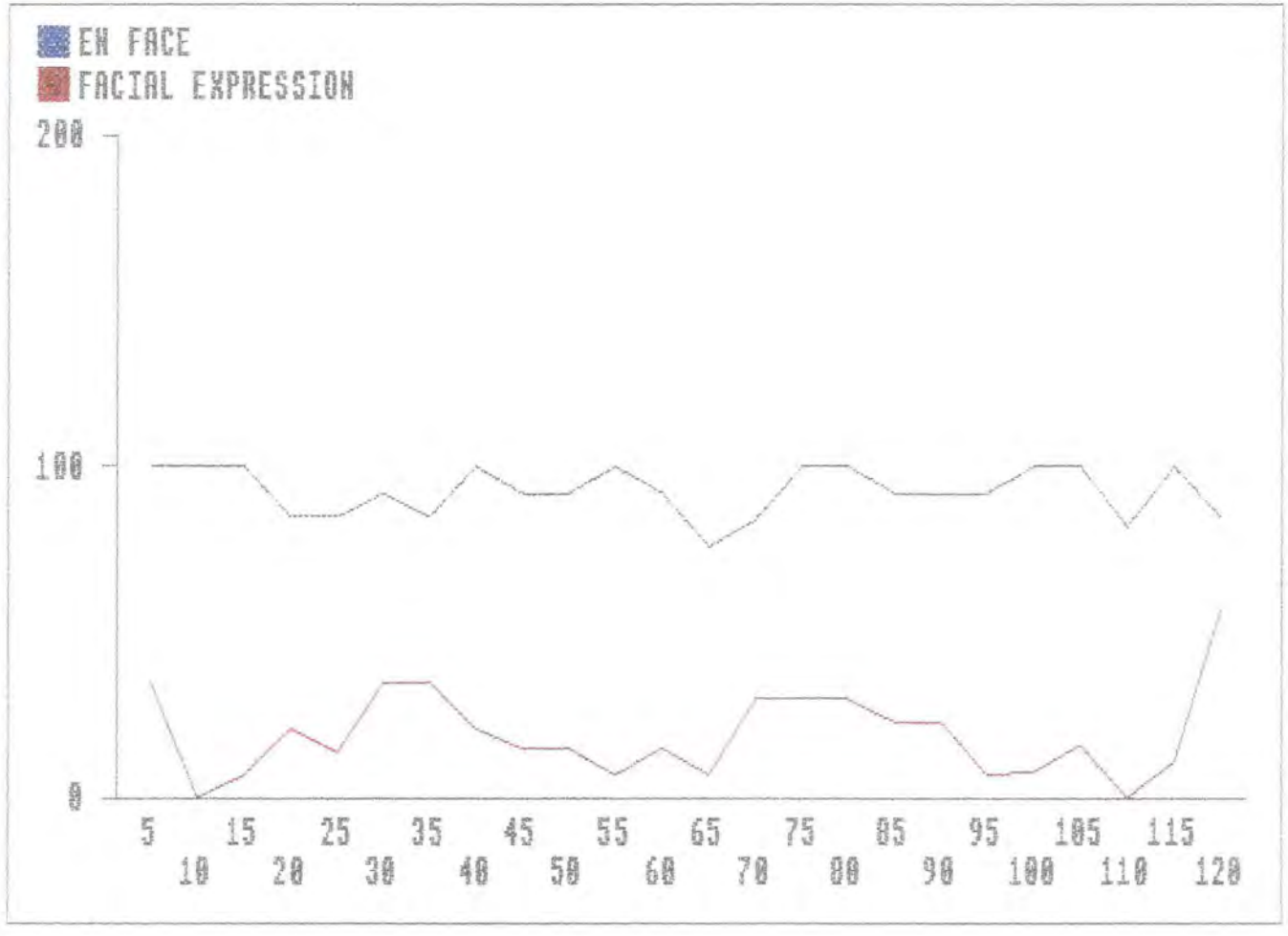
Child: MM

Appendix 28

Children's facial expression and adult en face behaviour


EN FACE
FACIAL EXPRESSION
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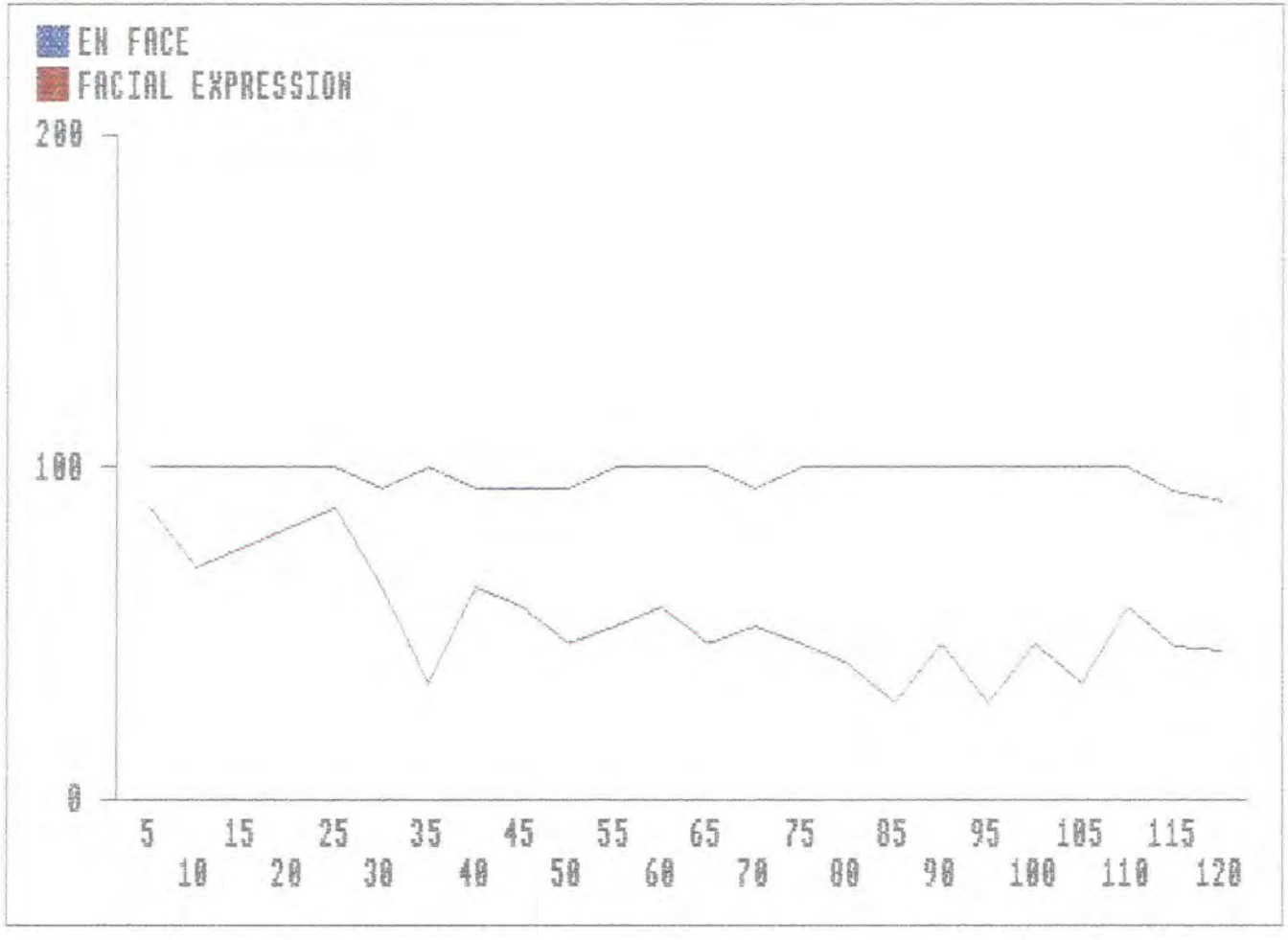
115
120

Child: AP


EN FACE
FACIAL EXPRESSION
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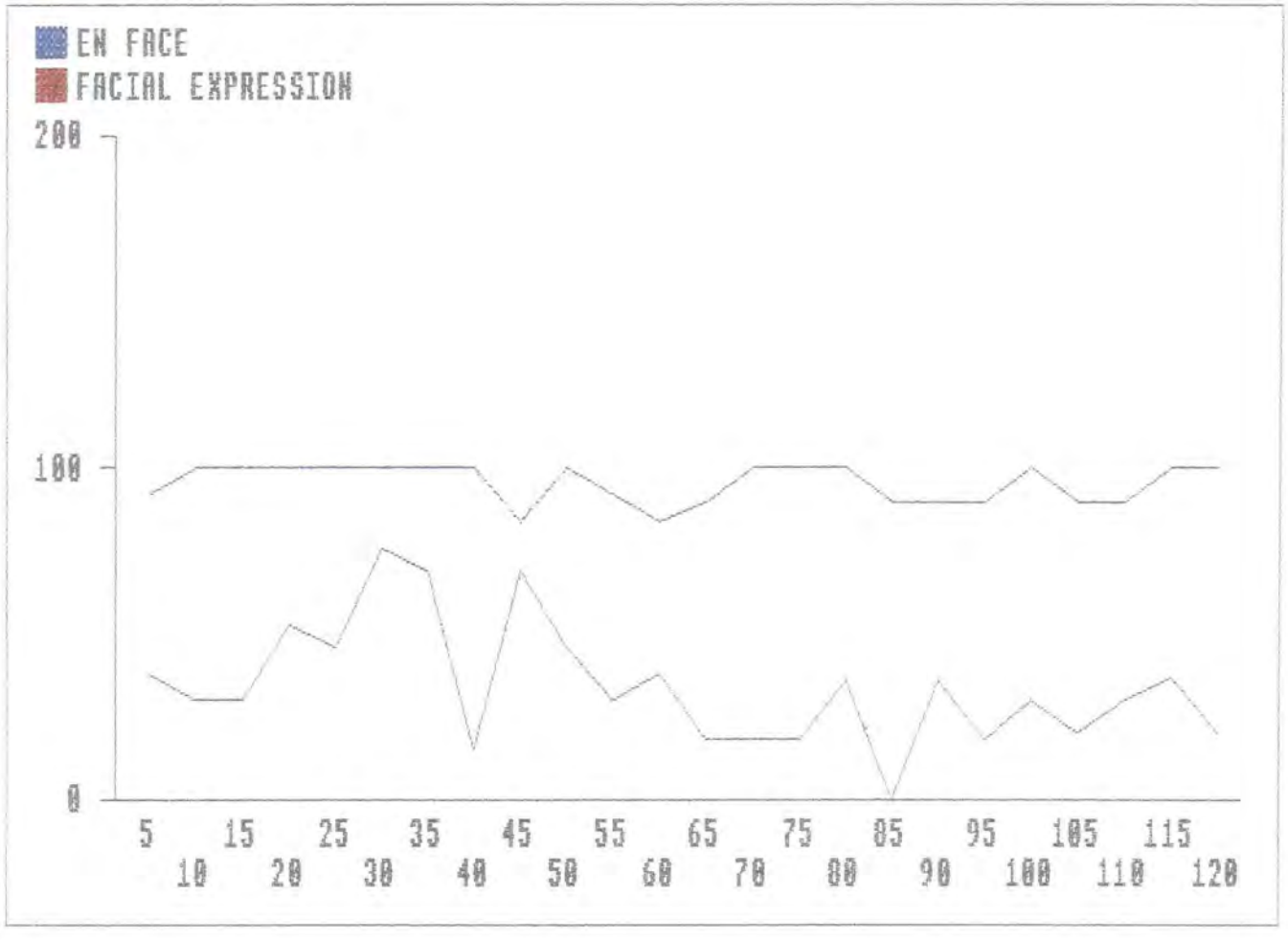
Child: DW


EN FACE
FACIAL EXPRESSION
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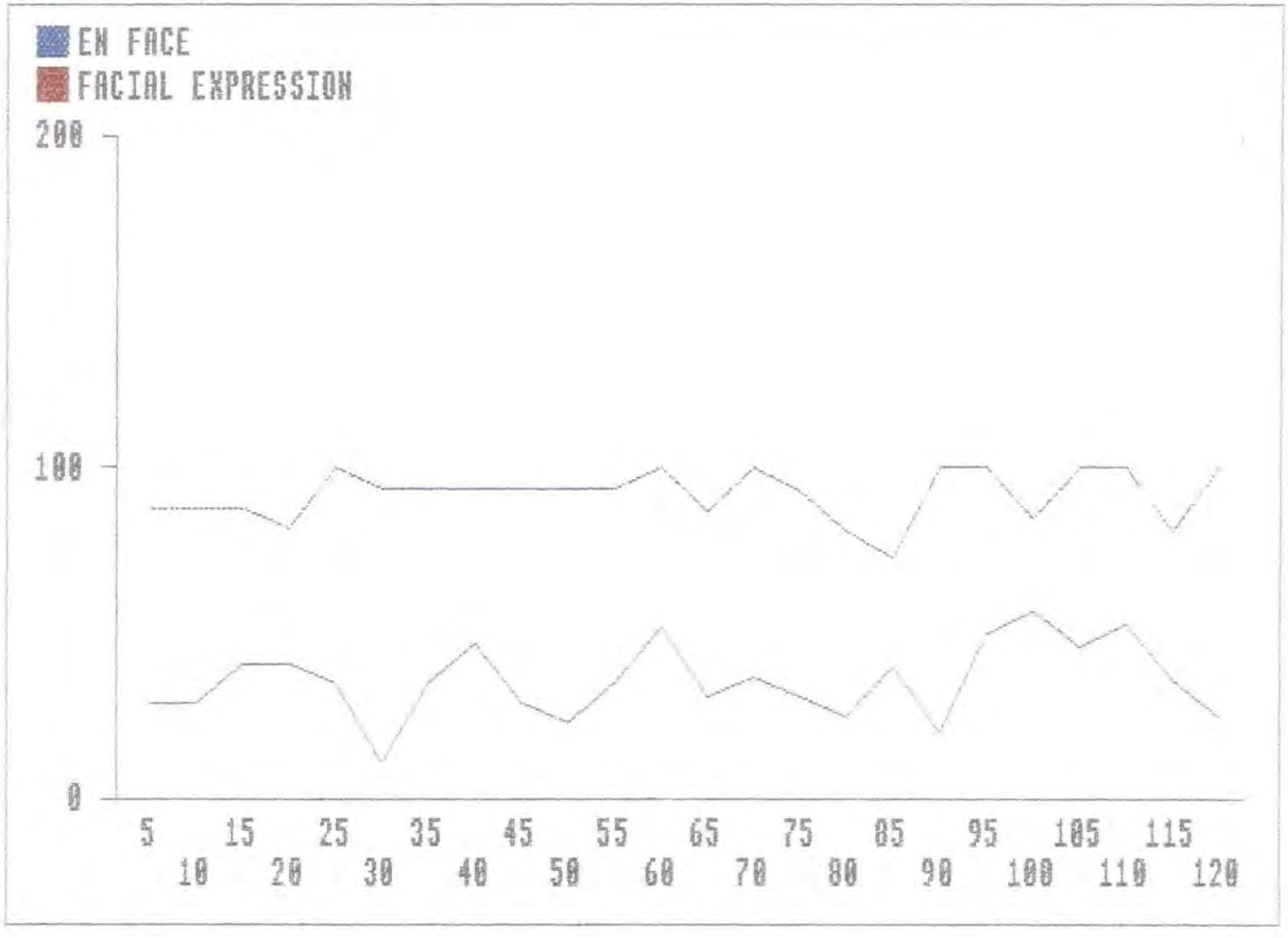
Child: JS


EN FACE
FACIAL EXPRESSION
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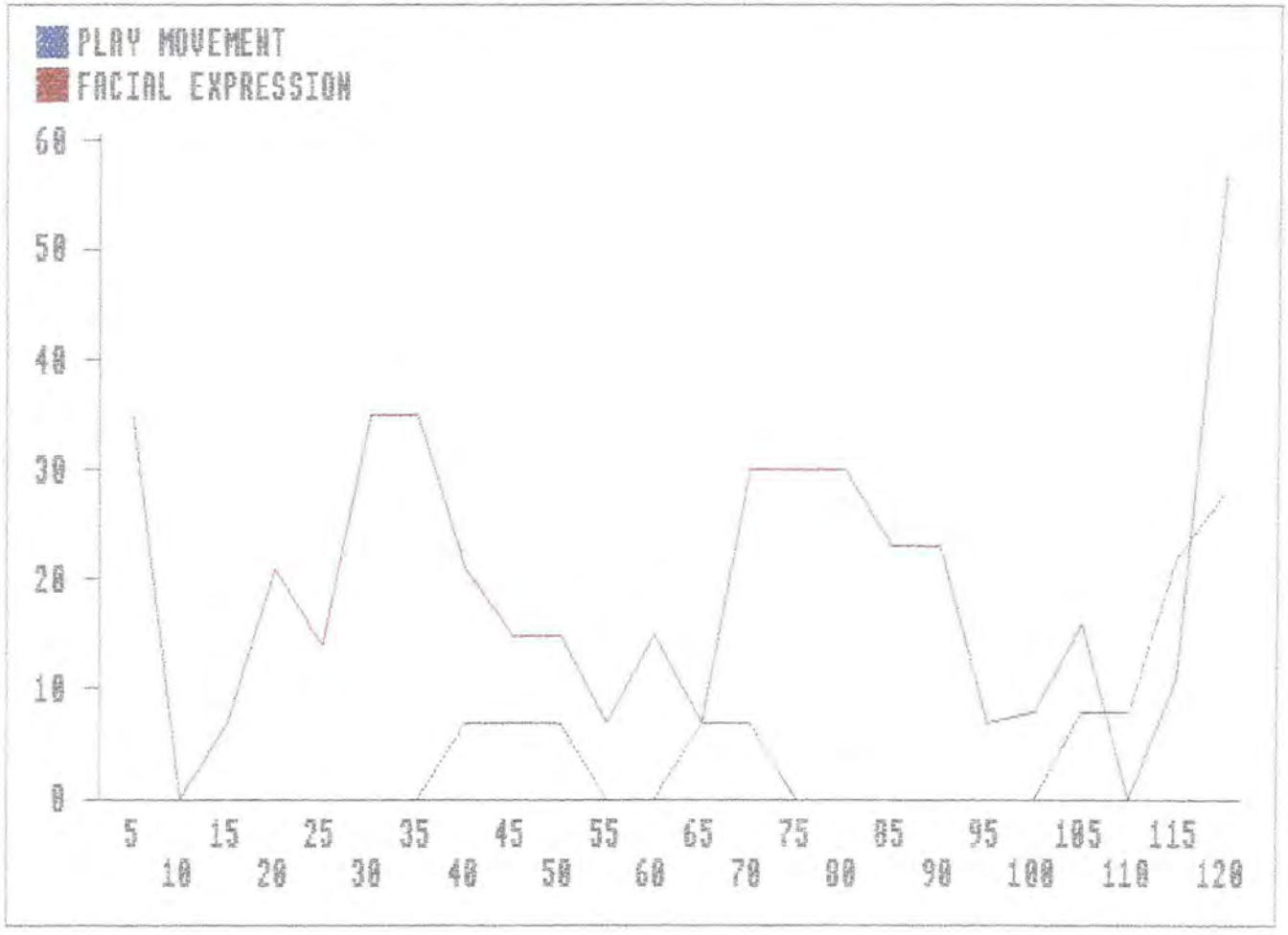
Child: MM

Appendix 29

Children's facial expression and adult play movements


PLAY MOVEMENT
FACIAL EXPRESSION
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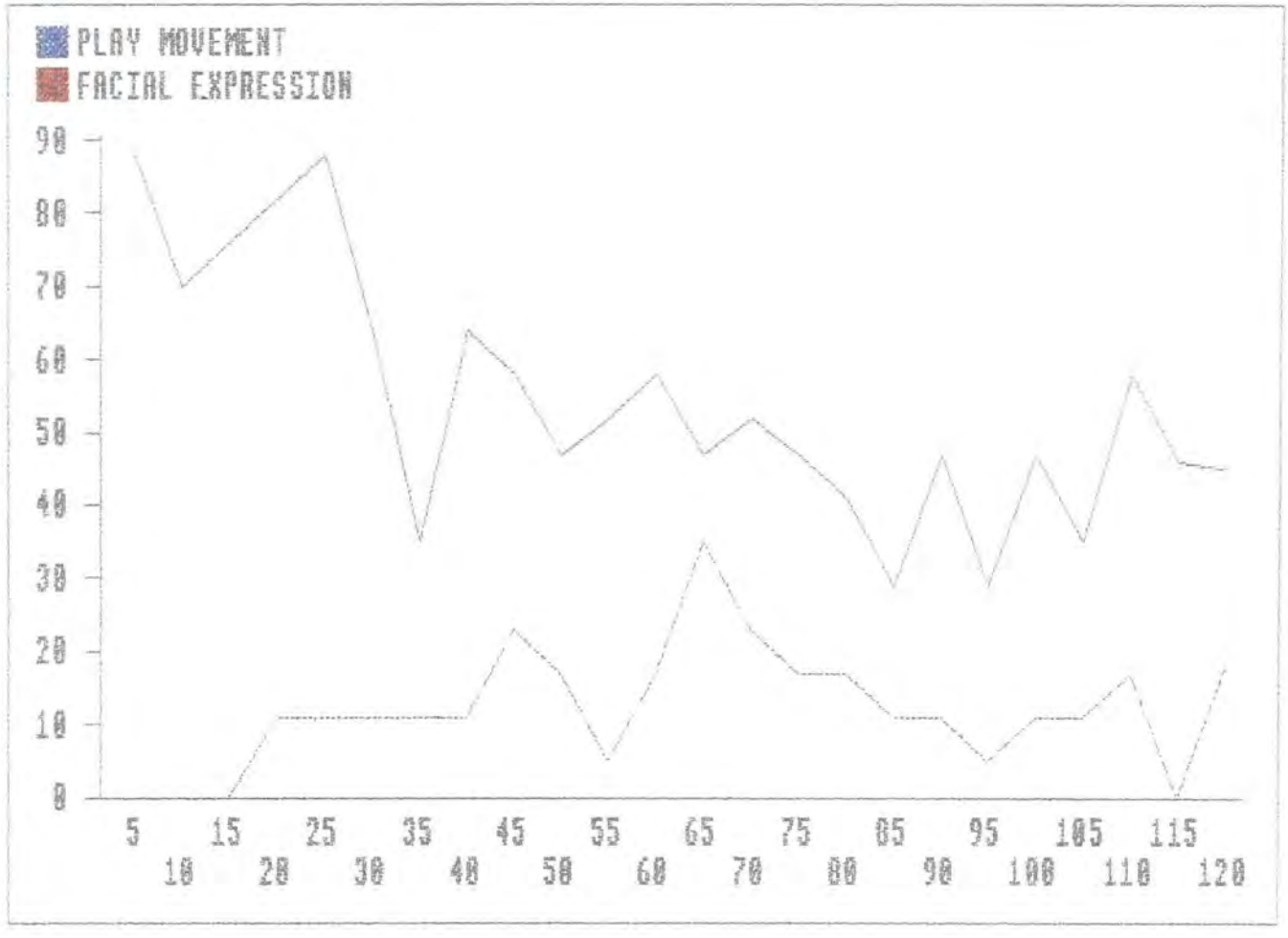
120

Child: AP


PLAY MOVEMENT
FACIAL EXPRESSION
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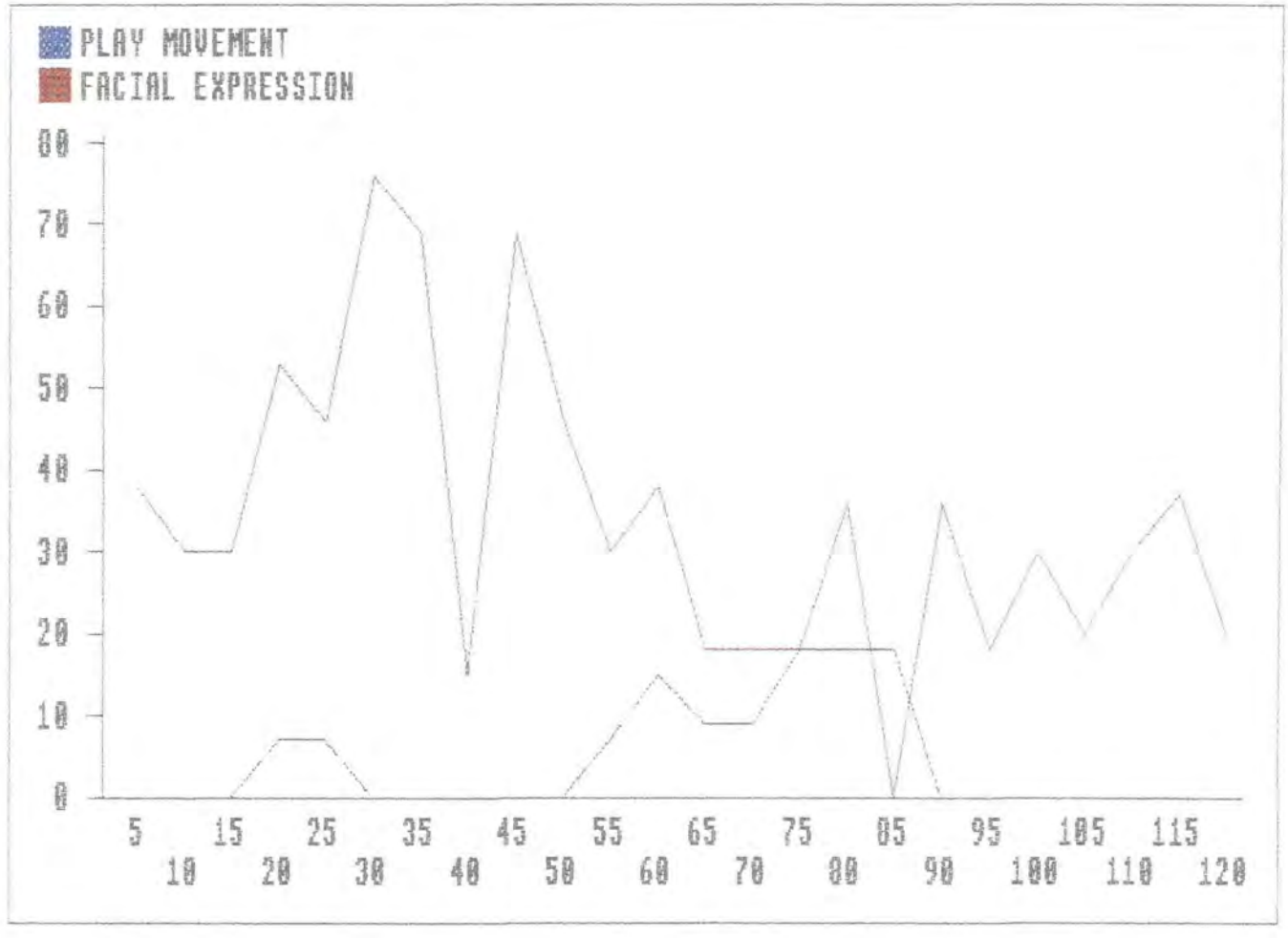
115
120

Child: DW


PLAY MOVEMENT
FACIAL EXPRESSION
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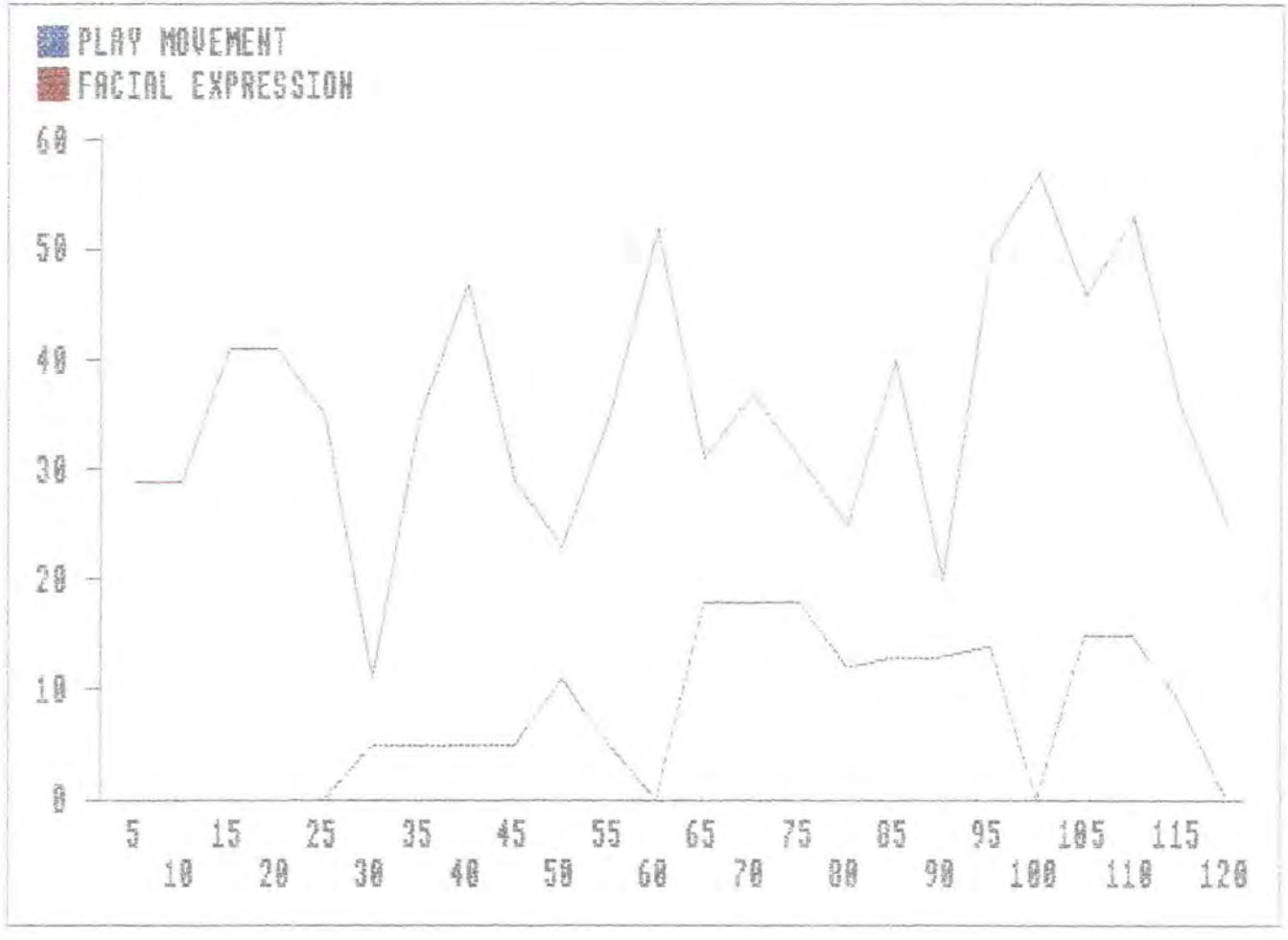
Child: JS


PLAY MOVEMENT
FACIAL EXPRESSION
60
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20
10
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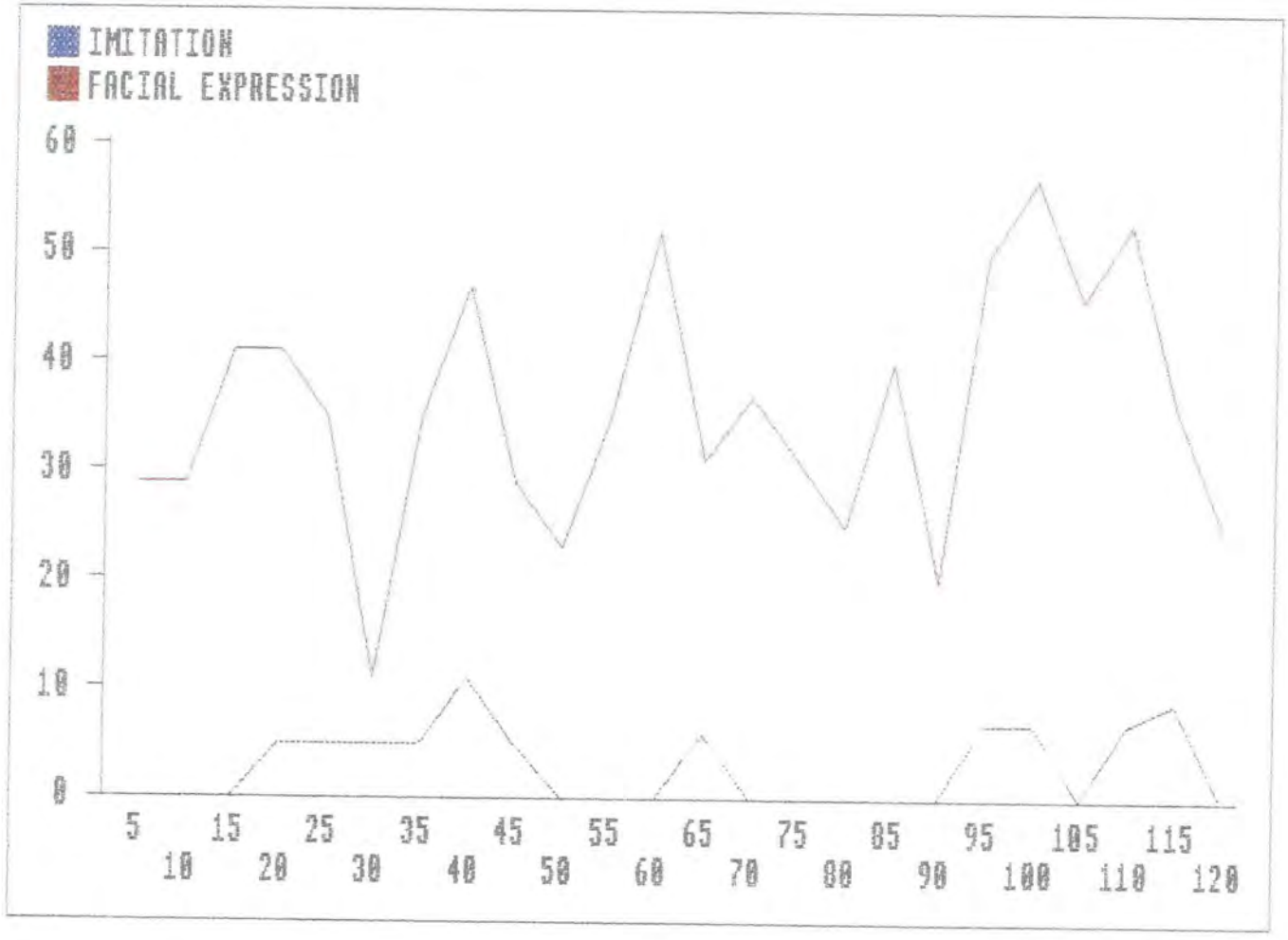
Child: MM

Appendix 30

Children's facial expression and adult imitation


IMITATION
FACIAL EXPRESSION
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20
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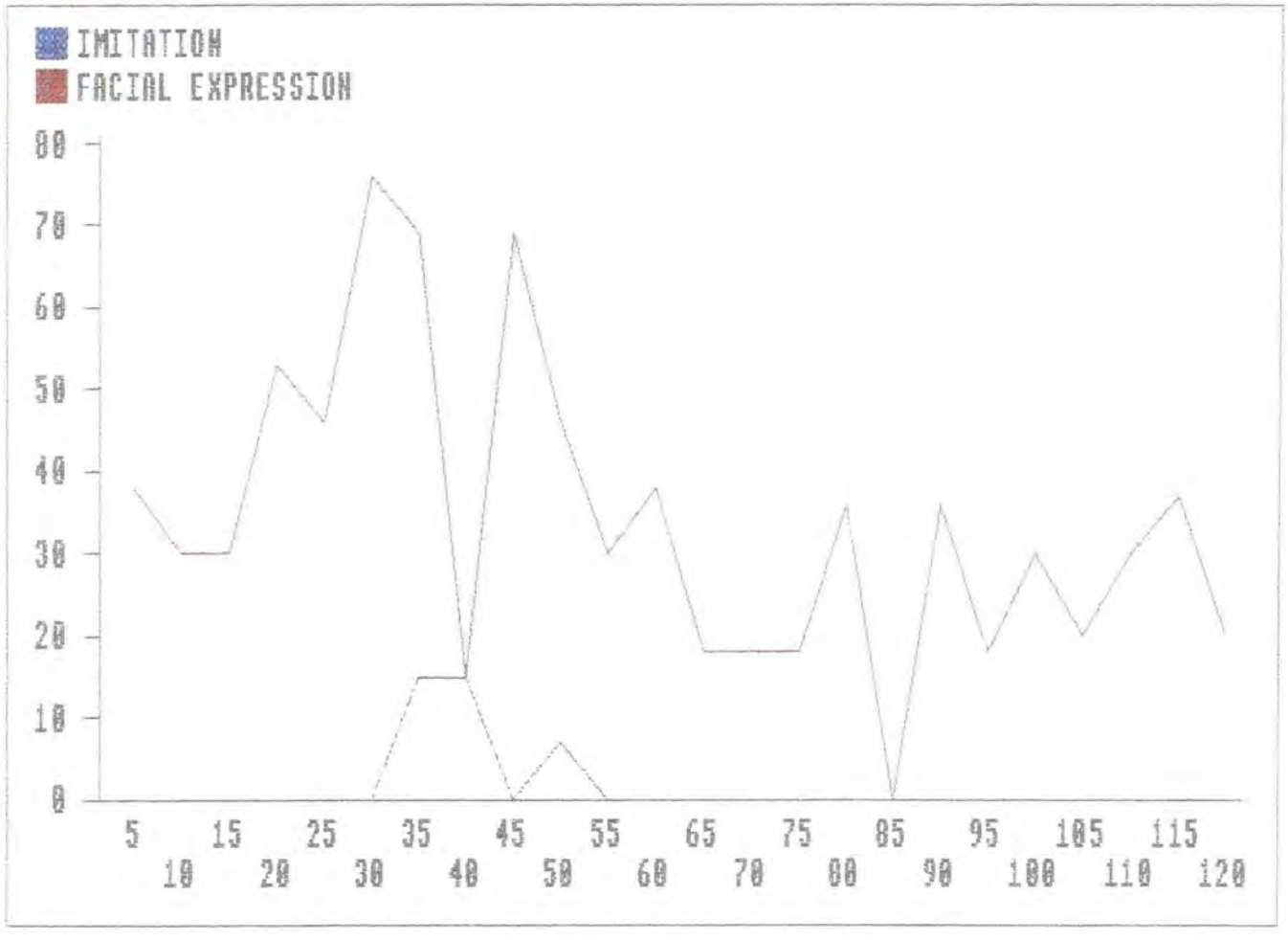
Child: MM


IMITATION
FACIAL EXPRESSION
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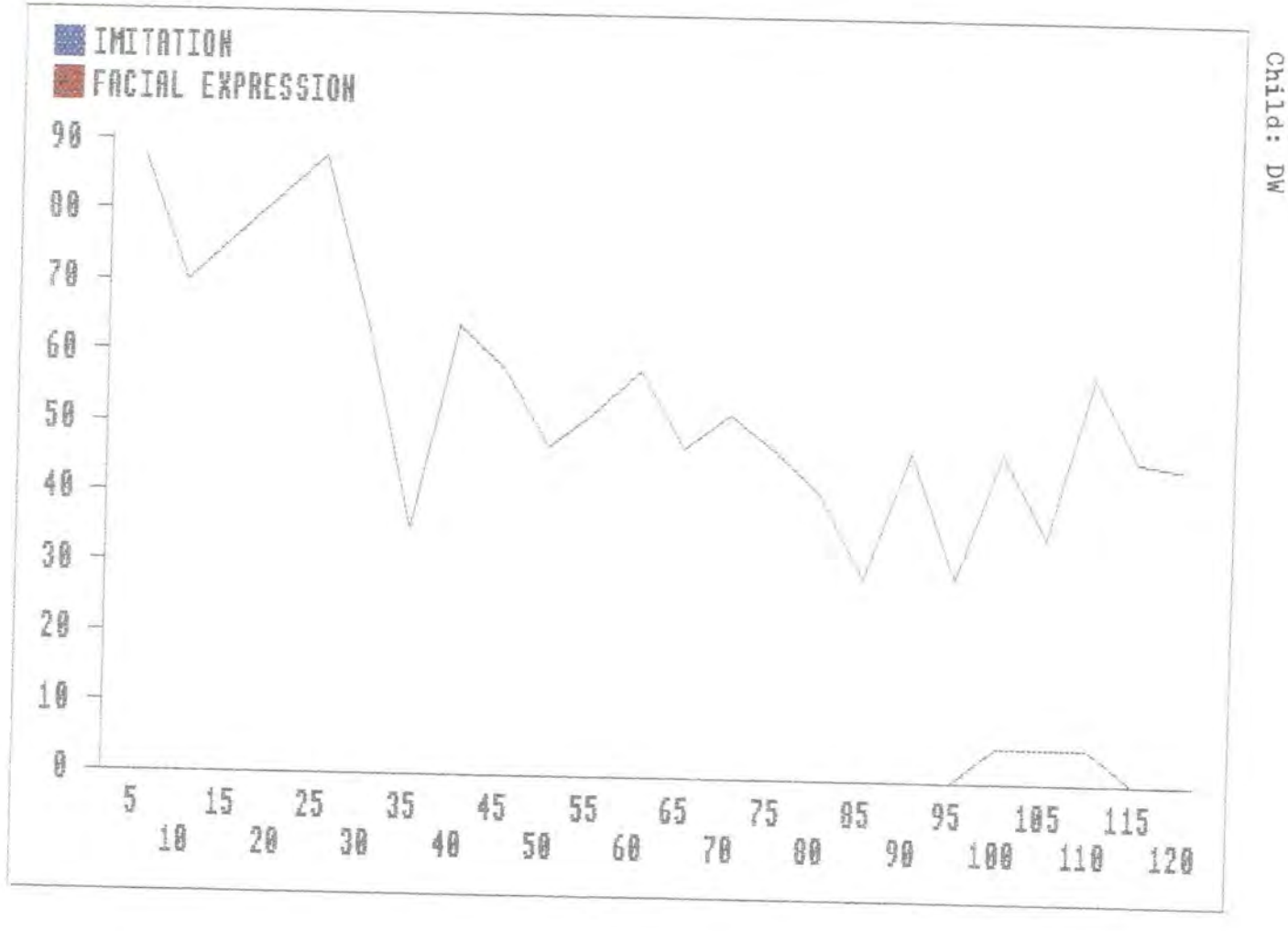
Child: JS


IMITATION
FACIAL EXPRESSION
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105
110
115
120
Child: DW

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